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of the

CHEST

OFFICIAL PUBLICATION



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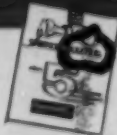
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2. Piper, C. E., and Nicklas, F. W.:
Indust. Med., 23:510, 1954.

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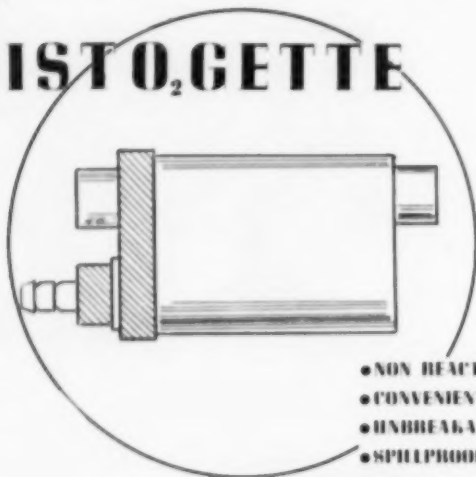
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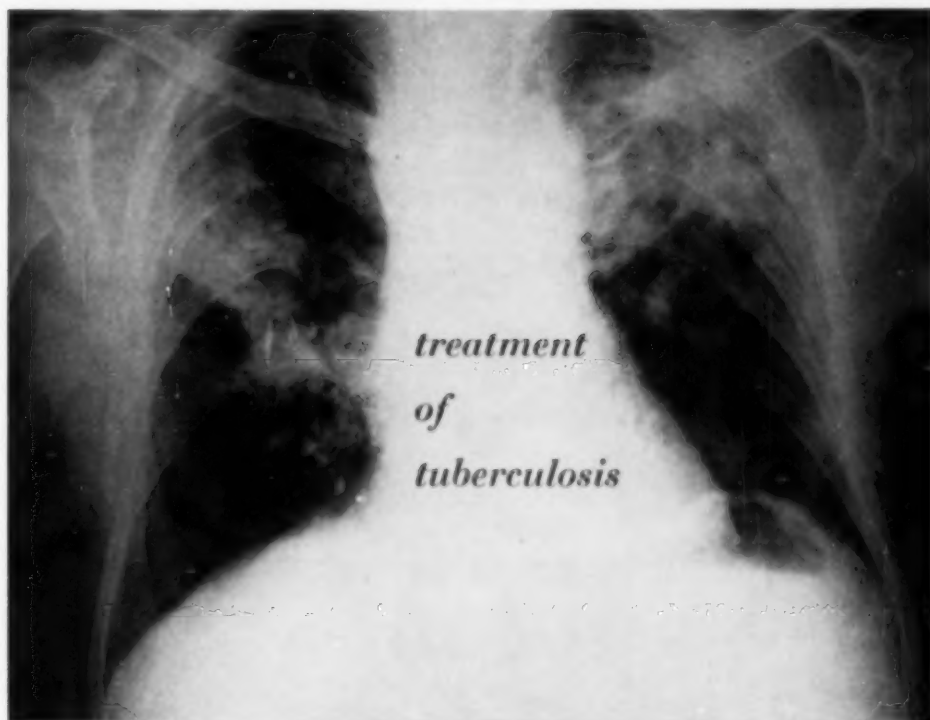
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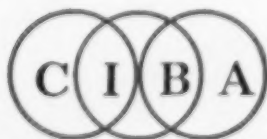
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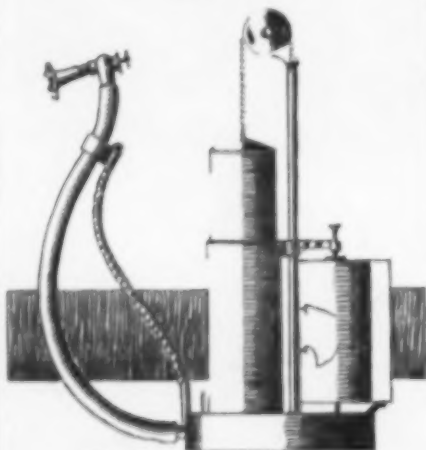
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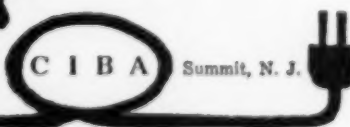
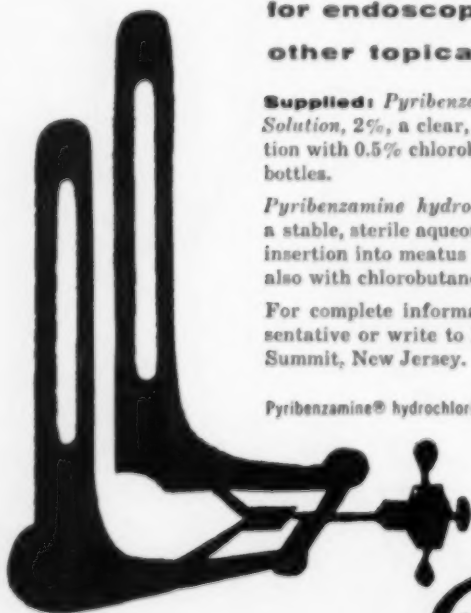
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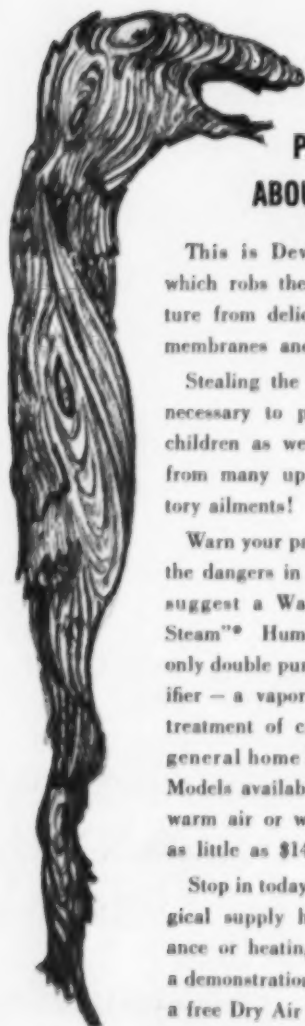
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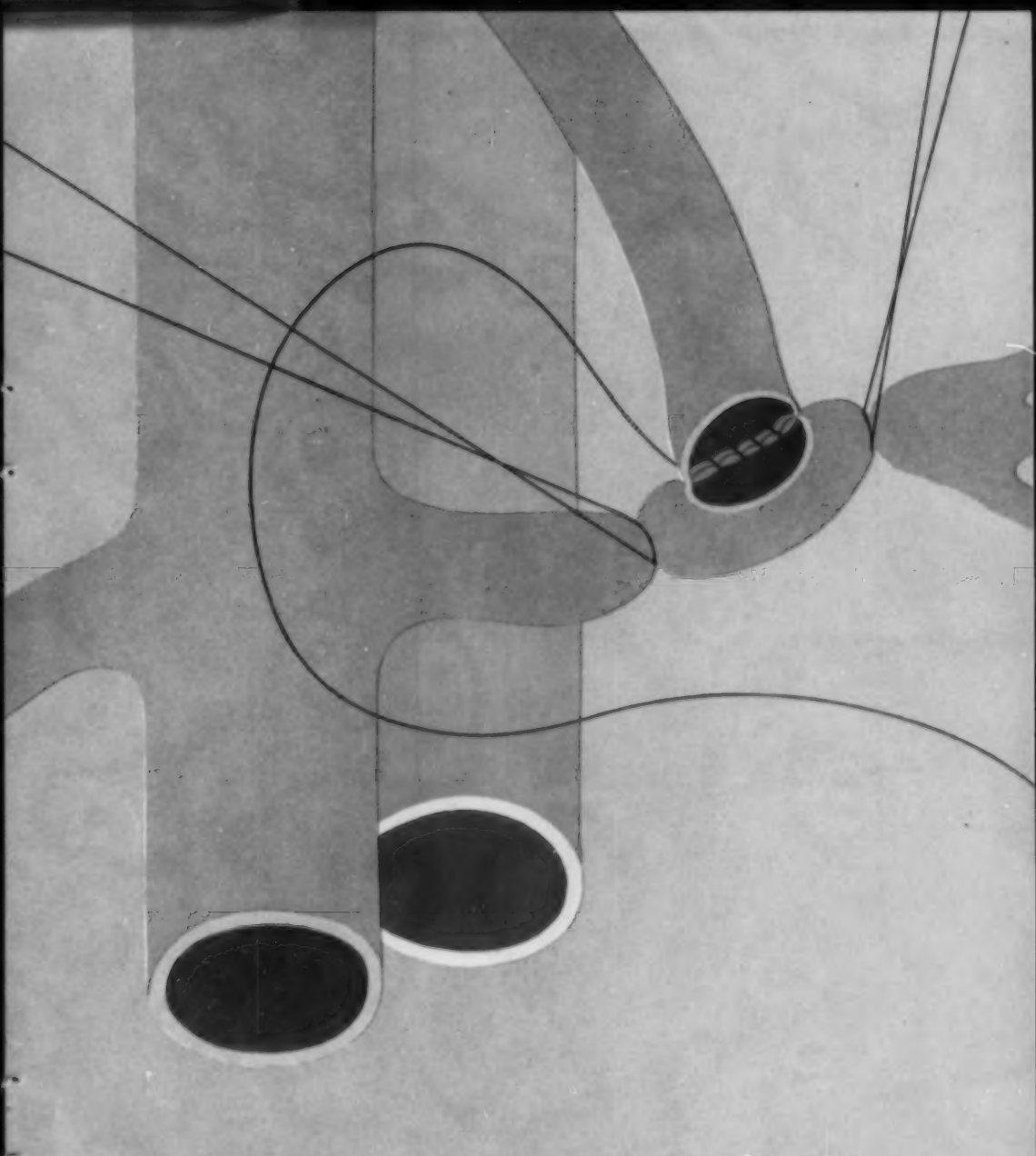
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2½ gr.	Aluminum Hydroxide	2½ gr.
none	Phenobarbital	¾ gr.

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3 gr.	Aminophylline	4 gr.
¼ gr.	Ephedrine-HCl	none
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2½ gr.	Aluminum Hydroxide	2½ gr.
none	Phenobarbital	¾ gr.

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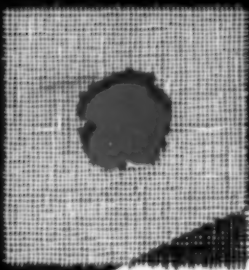
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1. Owings, C. B.: The Control of Postoperative Bleeding with Adrenosem, Laryngoscope, 55:31 (January) 1955.
2. Peck, J. C.: Adrenosem in the Control of Hemorrhage from the Nose and Throat, A.M.A. Arch. of Otolaryng. 61:450 (April) 1955.
3. Riddle, A. C., Jr.: Adrenosem Salicylate: A Systemic Hemostat, Oral Surg., Oral Med., Oral Path. In press.

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		Cochlear damage % of patients		
		Mild	Moderate	Total
Cat given the same amount of Distrycin has normal reflex.	Streptomycin	0	0	0
	Dihydrostreptomycin	12	3	15
	Distrycin	0	0	0

*Heck, W.E.; Lynch, W.J., and Graves, H.L.: *Acta oto-laryng.* 41:416, 1933.


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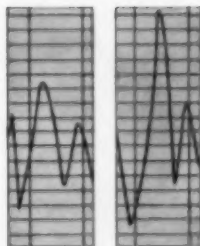
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1. Segal, M. B., and Delfano, M. J., Chronic Pulmonary Emphysema—Physiopathology and Treatment, Modern Medical Monographs, Grune and Stratton, New York, 1952.

2. Motley, H. L., and Smart, B. H., Pulmonary Emphysema: Physiologic Factors in Diagnosis and Advances in Therapy, Journal of the American Geriatrics Society, Vol. III, No. 5, May, 1955.

* Vaponefrin is a 2.25% solution of an especially purified racemic epinephrine, as hydrochloride, equivalent in pressor potency to approximately 1.25% U.S.P. reference standard epinephrine solution.

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*Lattimer, John K., and Spirito, A. L.: Clorpactin for Tuberculous Cystitis. *Journal of Urology*, Vol. 73, June, '55.

Wolinsky, E., Smith, M. M., Steenken, W., Jr.: Tuberculocidal Activity of Clorpactin, a new Chlorine Compound. *Antibiotic Medicine*, Vol. 1, No. 7, July, '55.

Swanker, W. A.: The Use of Clorpactin WCS 90 as an Antiseptic in Surgery. *Amer. Jnl. of Surgery*, Vol. 90, July, '55.

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DISEASES of the CHEST

VOLUME XXVIII

NOVEMBER, 1955

NUMBER 5

Symposium on the Rehabilitation of the Cardiac Patient*

Introduction

NATHANIEL E. REICH, M.D., F.C.C.P.

Brooklyn, New York

The magnitude of the cardiovascular rehabilitation problem is underscored by the fact that approximately 10 million Americans suffer from cardiovascular diseases. This has resulted in the highest rate of disability days per year in industry, the second leading cause of military rejections in the last Great War, and finally a great death toll—750,000 persons each year.

There is an increasing awareness on the part of physicians as well as medical, industrial, and governmental agencies of the necessity for a program of rehabilitation for individuals with cardiovascular disease. This eminent panel of specialists has been assembled to consider various aspects of the problems concerned with the rehabilitation of the cardiac patient.

Remarks

ALPHONSE P. GUARDINO**

The Board is keenly and intensely interested in the question of rehabilitation, not only in cardiac cases, but all cases wherein the disability arises out of and in the course of employment.

In the New York District the W. C. B. has initiated a pilot study in rehabilitation. The purpose of this study is to promote by better medical treatment of compensation claimants the following results:

- A. Reduction of period duration of disability.
- B. Reduction in the degree of permanent partial disability and other disabilities.
- C. Acceleration in date of return of disabled workers to employment.

The scope of this study is three fold:

1. Review the type of medical treatment demonstrated or prescribed in order to determine whether other medical treatment or care might be expected to produce better results and,
2. To recommend such other supplemental treatment to the claimant, carrier and the claimant's attending physician.
3. To record observations of the progress of patients undergoing such treatment and to prepare reports summarizing the results of the pilot study in such form as may be helpful to the medical profession in utilizing the medical treatment demonstrated as most effective in the types of disability studied.

*Presented at the 19th Annual Meeting, American College of Chest Physicians, New York City, May 29, 1953.

**Vice-Chairman of the Workmens' Compensation Board of the N. Y. State Dept. of Labor.

We are glad to report that during the last year this rehabilitation project won increasing support and cooperation from physicians for the claimants, claimants themselves and from the carriers.

Many severely handicapped persons, some formerly regarded as hopelessly disabled, as well as a large number of less severely disabled, have found a new sense of personal security through rehabilitation. This satisfying result has also reduced costs.

During the last year there were 1211 patients examined by the Board's rehabilitation specialists. Of these, 437 were actually referred for rehabilitation treatment and 142 were successfully rehabilitated in treatment programs closed during last year. In 61 other cases physical rehabilitation was completed in 1952 but the cases were held open for continuing supervision since other services were being rendered. A total of 184 cases remained open at the end of last year under active rehabilitation treatment and 50 were closed because rehabilitation evaluation indicated that treatment was not necessary.

Members of the Board Medical Staff continued to participate in professional and educational programs and presented workmen's compensation problems and techniques to various groups throughout the year.

Rehabilitation in Traumatic Pericarditis*

R. W. KISSANE, M.D., F.C.C.P.**

Columbus, Ohio

The possibility of traumatic pericarditis is usually disregarded or given only slight consideration, and often the diagnosis becomes submerged under the general classification of idiopathic pericarditis. This is noteworthy since animal experimentation and clinical observations have shown it to be the most common of all the non-penetrating traumatic lesions of the heart. The anatomical relations and characteristic of the the pericardium such as the attachment of the central tendons to the diaphragm, the frequent fusion with the pericardial pleura, the slight fixation by the sternal pericardial ligament to the inner side of the sternum, the elasticity and the irregularity of thickness, all make it vulnerable to injury.

The diagnosis should be considered whenever there is a history of trauma followed by cardiac symptoms or findings, especially if there is a fracture of the sternum or the junction of the ribs to this bone. The most common type of injury is a direct blow to the anterior chest. However, the more serious degrees of cardiac trauma are produced by crushing between objects, falling from heights, and compression of the body trunk with cardiac displacement. Nevertheless, it is well to remember that non-

*The Cardiological Department of The Division of Medicine of Ohio State University, College of Medicine, and White Cross Hospital, Columbus, Ohio.

**Professor of Medicine in Cardiology, Ohio State University, Columbus, Ohio.

penetrating injury to the thorax may produce penetrating wounds of the pericardium by fractured fragments of the bony cage.

The records were collected on a group of 42 persons who had suffered this type of injury. All were under 50 years of age and none revealed any evidence of pre-existing cardiac disease. Autopsies were obtained on all persons in this group within two years of the time of the injury, and in no case could the cause of death be considered as cardiovascular. All cases revealing a cardiac rupture or penetration were excluded. Consideration of those who received moderate thoracic injury revealed the most common lesion to be pericardial and subpericardial hemorrhage with small visceral pericardial tears. There was no evidence of a healing process until after three weeks, but it was complete within three months, and resulted in scar tissue thickening of the pericardium with occasional small adhesions. In those who had had an associated myocardial contusion, the area of muscle fragmentation and hemorrhage was replaced by fibrosis. This was also true of those who had received severe cardiac trauma. However, many of them had complications such as myocardial contusions, pericardial effusion, hemopericardium, large lacerations of the visceral pericardium, hemorrhage about the great vessels, and, in a few, infection. These complications increased greatly the formation of adhesive pericarditis and obliteration of the sac, especially in those who have had an infection or a hemopericardium.

The signs, symptoms and electrocardiographic changes of traumatic pericarditis are the same as those found in any type of pericarditis except that they are frequently submerged or altered by the severe injury and fractures of the thoracic cage. One peculiarity is that heart consciousness with tachycardia, palpitation, premature contractions, and precordial pain, exists for a long time after all clinical and pathological studies indicate complete recovery with normal function. Many developed what was described a few decades ago as an effort syndrome. Patients interpret these sensations as proof that they are suffering from irreversible heart damage and decrease in cardiac function. However, they do not show the same concern in regard to the symptoms of their more serious and often fatal body injuries. Anxiety is a frequent symptom of most cardiac diseases including traumatic. It therefore appears that our first concern pertaining to rehabilitation should be an honest statement to the patient as to the extent of the cardiac injury, and an estimation of the time and ultimate prognosis based upon the available pathological and clinical knowledge. Repeated explanation of the symptoms with the object of creating confidence and encouragement is necessary for the prevention of cardiac neurosis. This is the responsibility of the attending physician and should not be delegated to others. The entire situation is also influenced by the economic problems of industrial compensation, insurance, and personal liability, and the general principles of rehabilitation differ from those presented by other cardiac conditions only because there is a short convalescence with 80 per cent complete recovery.

Another group of 23 patients were chosen because they had had moder-

ate to severe non-penetrating injuries to the chest without other trauma. They all had positive signs, including electrocardiographic evidence of pericarditis. There was an associated myocardial contusion in 10. The entire group not only survived, but clinically had returned to normal. This point of recovery, however, did not always coincide with the patient's opinions. In the young high school and college athlete group they frequently denied or minimized their symptoms and presented a strong, if not convincing, argument that they were completely normal, even when a friction sound could be heard and the electrocardiographic tracing was still abnormal. Against advice, they would return to their athletic endeavors and relate the results as positive proof that everything was all right. There were five cases in this group and within one to two months I had to admit they were normal. None of them had any further difficulty. There were seven older patients who reacted to the other extreme, in that it required about one or two months after their clinical recovery to convince them that they should enjoy normal cardiac function. Based on this experience, I believe it is well to encourage moderate, controlled activity within a few days, or as soon as it is certain that serious complications are not likely to occur. As a word of caution, it is probably well to wait until the possibility of a superimposed infection has passed or been prevented by antibiotic therapy. When there is also a myocardial contusion, the judicial course of action depends upon an estimation of the extent of the myocardial damage.

There is a natural realization in the patient's mind that the traumatic etiological factor is no longer present, nor likely to return. Their attitude is also different, because medical treatment is rarely necessary except for the immediate symptoms, occasional arrhythmia, and the complications in the more severe cases. Cardiac trauma can, of course, occur to an individual who has heart disease, but this does not alter the fundamental concept, because aggravation of a pre-existing condition is only occasional and the patient should be assured as soon as possible that the cardiac function has returned to the former status.

The information received from this group study reveals that surgical procedures for the correction of the associated body injuries need not be postponed except in a very few cases. Frequently it was found that successful, extensive surgical operations had been performed shortly after the injury, and many times without the knowledge that a traumatic cardiopathy existed. Cardiac surgery is also occasionally needed for the treatment of the pericardial complication. Thought should also be given to the observation that the pericardial and myocardial trauma produced by cardiac surgery does not have the associated degree of anxiety nor the residue of symptoms that are associated with the non-penetrating injury. Probably the hope of improvement engendered by the surgical procedure is the differentiating factor. These characteristics of the traumatic cardiopathies present an excellent opportunity to increase our knowledge of the problems involved in the rehabilitation of those suffering from heart disease.

Methods of Evaluating Work Capacity of Cardiacs*

JOHN G. BIELAWSKI, M.D.**

Detroit, Michigan

The clinical impression gained from the history and physical examination are the best guideposts to the evaluation of the work capacity of the cardiac patient. We have come to this conclusion based on our experience within the medical department of a large automobile plant. This experience was gained while conducting a cardiac case finding survey in this plant. Our objective was not to try to make a statistical study of the number of cardiacs within the plant but to find out how frequently cardiac disability is encountered within the medical division of an average industrial medical department. For this purpose (Table I) a total of 2,471 con-

TABLE I
TOTAL RECORDS EXAMINED

	40-49	50-59	60-69	70 +	Total
New Employees	958	71	3	—	1032
Hourly Rated	526	426	295	8	1255
Supervisory	92	71	21	—	184
Total	1576	568	319	8	2471

secutive patients were subjected to survey. Of these, 1,032 were new employees, 1,255 were hourly rated (production line and assembly workers), 184 were supervisory (white collar workers).

Of an hourly rated group of 1,255 individuals, there was known angina of effort in 13; X-ray evidence of hypertrophy of the heart in three, known rheumatic heart disease in three. One of these, incidentally, was an individual who had had mitral commissurotomy. This individual had been incapacitated for work and was once again employable after the surgery. There were three instances of congestive failure. In this group, then, the medical history showed 22 who had cardiovascular abnormality. In the supervisory group of 184 there was known angina of effort in seven and rheumatic heart disease in one—a total of eight who had known history of cardiovascular disease. Both of these groups had normal electrocardiograms. In addition, in the total group hypertension defined as anything over 160/90 was found in 308 individuals. This, then, gave us a grand total of known abnormalities of the cardiovascular system with normal electrocardiogram in 330 of the 2,471 case records that were surveyed.

An electrocardiogram was done on each individual. The percentage of abnormality discovered was rather high (Table II). Two interesting aspects were noted. First that there is a steady increase in the percentage of abnormality with increasing age. Secondly that there is a correlation between the percentage abnormality in the hourly rated and the super-

*This study was made through a grant by the Michigan Heart Association.

**Medical Director, Michigan Heart Association.

TABLE II
ABNORMAL EKG'S

	40-49	50-59	60-69	70 +	Total
New Employees	23 (958)	6 (71)	1 (3)	—	30 (1032)
Per Cent	2	9	33	—	3
Hourly Rated	41 (526)	74 (426)	58 (295)	1 (8)	174 (1255)
Per Cent	10	17	19	—	13
Supervisory	11 (92)	7 (71)	8 (21)	—	26 (184)
Per Cent	11	10	38	—	14
Total	75 (1576)	87 (568)	67 (319)	—	230 (2471)
Per Cent	5	15	21	—	9

The figures within the brackets indicate the number of those examined in each age group.

visory group. This correlation for statistical purposes is not significant but it is in keeping with other studies which have shown rather close similarities in these two groups. The type of electrocardiographic abnormality discovered at these routine electrocardiograms which were of an ostensibly healthy group aside from the 30 who had known cardiovascular defects and the 308 who had only hypertension is presented in Table III. These are significant abnormalities except for those showing right bundle branch block. Some of these were found in the new employees. In these the presence of right bundle branch block in otherwise completely asymptomatic normal individuals was considered as being an incidental finding and probably normal for that individual. It did, however, furnish a useful future base line should cardiovascular difficulty or question of such arise. As to the usefulness of electrocardiography as a tool in the discovery of heart disease, it is interesting to note that of this total of 240 abnormal electrocardiograms roughly one third knew that they had some cardiovascular lesion and the other two thirds had no prior knowledge of any lesion (Table IV). Their base line electrocardiogram will be, we are sure, of use to them in the future course of their life. The grand total found at this survey then was 560 individuals with a detectable cardiovascular abnormality out of the 2,471 surveyed, an astounding percentage of 36

TABLE III
TYPES OF EKG ABNORMALITY

	New Employees	Hourly Rated	Supervisory	Total
L.V.H.	3	59	10	72
R.V.H.	—	3	—	3
L.V. Damage	11	67	10	88
Infarcts				
Anterior	2	8	2	12
Posterior	2	13	2	17
RBBB	7	20	2	29
LBbB	2	2	1	5
Arrhythmias	3	11	—	14

TABLE IV
PRIOR KNOWLEDGE OF HEART DISEASE
(In Those with Abnormal EKG)

	New	Hourly Rated	Super- visory	Total
Yes	0	62	11	73
No	30	112	15	157

of the cases coming through this large industrial medical clinic with detectable cardiovascular disease.

These screening methods did not, however, tell us much about the work capacity of these men. Many were already markedly restricted. Many, however, were asymptomatic and felt themselves in good health. Actual advice about job placement to each person was based on clinical evaluation. Adequate selective job placement was attempted on an individual basis whereby the physical reserve of the patient was correlated with the physical demands of the job. This involved knowing something about job titles and what the specific duties of these jobs entailed. We found that patients—and their foremen—must be told what they may do but also what they should not do. The familiar and easy advice to "get a light job" was inadequate. Our familiar American Heart Association Functional and Therapeutic Classification was also inadequate. There was no provision there for jobs which entailed danger to the operator of a machine should he get dizzy, or even more important, danger to others, as is the instance with crane operators, truck drivers and the like.

This led to a general breakdown of the job demands into (1) work environment and (2) physical demands. This was done in collaboration with E. A. Irvin, M.D., Medical Director of the Cadillac Motor Division (Table V). Under Environment item 1, of course, applies to those with no restrictions and no symptoms. Items 2, 3, and 4 are applicable particularly to those with rheumatic heart disease in whom the development of upper respiratory infections should be prevented. Item 5 principally applies to those with pulmonary disease such as the asthmatic and the emphysematous individual who have lurking in their background cor pulmonale. Item 6 also applies to those with rheumatic heart disease. Items 7 and 8 apply to those who have angina and dizziness and also, of course, to the diabetic who is on high insulin dosage. Items 9 and 10 apply to those with angina and to those hypertensives who are easily upset. Item 11 is considered where there is congestive failure or severe angina pectoris.

II Physical Activities: Under this heading walking, stair climbing, sit down work, reaching are all specifically explanatory. Stooping, lifting and carrying and their frequency and even the height of lift can be rather closely outlined both as to how much can be done and how much should be done. Items 7 and 8 specifically relate to hazardous occupations which are of importance in the presence of angina or hypertension with complaints of blackout or dizzy spells. They apply also, of course, to the diabetic on high insulin dosage. Item 9 particularly applies to the hypertensive and

TABLE V
CARDIAC ACTIVITY RESTRICTIONS

I. ENVIRONMENTAL:

- (1) No restrictions
- (2) No outside work
- (3) No temperature extremes (hot or cold)
- (4) No humid exposure
- (5) No dust or fumes
- (6) No wet exposure
- (7) No afternoon or night shift
- (8) Ground-level work only
- (9) Low noise level
- (10) Low emotional tension
- (11) Favorable transportation conditions

II. PHYSICAL:

- (1) Walking
 - (a) restricted to less than 50 per cent
 - (b) restricted to less than 25 per cent
 - (c) restricted to less than 10 per cent
 - (d) no walking
 - (2) Stair climbing
 - (a) slow with rest
 - (b) none
 - (3) Sitting-down
 - (a) part-time (minimum 50 per cent)
 - (b) full-time
 - (4) reaching
 - (a) occasional
 - (b) none
 - (5) Stooping
 - (a) occasional
 - (b) none
 - (6) Lifting and carrying
 - (a) Weight (expressed in pounds)

50 lbs.	15 lbs.
35 lbs.	10 lbs.
25 lbs.	5 lbs.
	1 lb.
 - (b) Frequency
 - 1. constant
 - 2. intermittent
 - 3. occasional
 - (c) Height of Lift
 - 1. floor to waist level
 - 2. waist to shoulder level
 - 3. above shoulder level
 - (7) No hazardous machines
 - (8) No vehicle driving
 - (9) No highly repetitive work
-

to those with angina in whom highly repetitive work which is usually very speedy may prove exceptionally fatiguing. Table VI shows a form which has been developed embodying all these restrictions and advice. This form has been proved useful in actual performance.

This form itself will not be used universally, but there is one thing all of us can and should do for the better job placement of our cardiac patients. That is to telephone the industrial physician at the plant where the patient is employed. Talk it over with him. One short phone call is worth more than the most detailed of letters concerning your patient's physical status and will result in more satisfactory and adequate job placement.

CARDIAC ACTIVITY RESTRICTIONS

TABLE VI

I. ENVIRONMENTAL									
1. NO RESTRICTIONS			2. NO OUTSIDE WORK			3. NO TEMPERATURE EXTREMES (Hot or Cold)			
4. NO HUMID EXPOSURE			5. NO DUST OR FUMES			6. NO WET EXPOSURE			
7. NO AFTERNOON OR NIGHT SHIFT			8. GROUND-LEVEL WORK ONLY						
9. LOW NOISE LEVEL			10. LOW WORK TENSION			11. FAVORABLE TRANSPORTATION			

II. PHYSICAL									
1. WALKING									
RESTRICTED TO LESS THAN:									
A. 50%	B. 25%	C. 10%	D. NO WALKING	2. STAIR CLIMBING					
				A. SLOW WITH REST					
				B. NONE					
3. SITTING-DOWN									
A. PART-TIME (MINIMUM 50%)									
B. FULL-TIME									
4. REACHING									
A. OCCASIONAL									
B. NONE									
5. STOOPING									
A. OCCASIONAL									
B. NONE									
6. LIFTING AND CARRYING									
A. WEIGHT (Expressed in pounds)									
B. FREQUENCY: 1. CONSTANT									
C. HEIGHT OF LIFT									
	2. INTERMITTENT	3. OCCASIONAL							
1. FLOOR TO WAIST LEVEL									
2. WAIST TO SHOULDER LEVEL									
3. ABOVE SHOULDER LEVEL									
7. NO HAZARDOUS MACHINES									
8. NO VEHICLE DRIVING									
9. NO HIGHLY REPETITIVE WORK									

Administrative Problems Affecting Cardiac Patients

JACOB SCHUTZBANK

The words "Accident, Notice and Causal Relation" under the New York State Workmen's Compensation Law are words of "art" that embrace only "those accidents or occupational diseases" that "arise out of and in the course of employment."¹ The Court of Appeals of this state, in a recent decision, advised "whether a particular event was an industrial accident is to be determined, not by a legal definition, but by the common sense viewpoint of the average man."²

The effect of overexertion or strain as an accidental insult to the heart has long held the attention of physicians, the Workmen's Compensation Board and Courts. The damage to the heart brought on by overexertion or strain in the course of daily work, has been held to be a compensable claim, though a pre-existing pathology may have been a contributing factor.³

The most important factor in each case is the medical record. Peculiarly enough the medical record does not begin with the physician. The medical record begins with the claimant. As early as possible, the claimant should be questioned in detail, about his work during his employment, where and when he first noticed symptoms; the extent of pre-existing heart disease or other non-cardiac complications, if any, and periods of hospitalization. The medical reports filed by the attending physician should fully reflect such history and render an opinion as to whether the accident was a competent producing cause of the injury sustained, aggravating or activating a previously existing condition, resulting in the present disability.

The obligation of the employer or carrier to provide medical care and pay compensation commences with knowledge of a claim and disablement, except in controverted cases.⁴ The relationship between the physician and his patient is more defined, once there is a claim that the disablement is work-connected.⁵ It is then of the utmost importance for the attending physician to understand that where the claimant is disabled and has a reduced or no actual earning capacity, the Board must have due notice of the nature of his injury and physical impairment, so that it can fix the degree of disability of the claimant and establish his rate of compensation within the maximum and minimum provided by law.⁶

Since the right to receive compensation is dependent upon the submission by the claimant of medical proof of disability and the relationship of such disability to the accident, the importance of the prompt filing of adequate medical reports in adjudication of compensability of the claim and the right of the claimant to receive medical care and payment of compensation, cannot be overemphasized.

It is interesting to note that in a tabulation of the closed cases covering the period from January, 1952 to June, 1952, in 66.5 per cent of the cases,

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the C-104, *Attending Physician's 48-Hour Preliminary Report*, was filed; that in 63.7 per cent of the said cases, the C-104s *were filed within five days after first treatment*. During the same period, in 94.5 per cent of the cases the C-4, *Attending Physician's Report*, required to be filed within 15 days after first treatment, *was only filed in 41.4 per cent* of said cases, within 18 days after first treatment.⁷

It should be pointed out that the C-4 report required to be filed within 15 days after first treatment, is the report in which the attending physician should render an opinion as to whether or not the accident described was a competent producing cause of the injury sustained, and whether the claimant has any degree of disability.

The problem of disability due to heart conditions held to be work-connected, is emphasized by the number of awards made in compensation heart cases closed in the years, 1947, 1948 and 1949 (Later figures not available).⁸

Cases Numbered In	Number of Cases	Weeks Awarded	Amount of Compensation
1947	167	89,325	\$1,023,561
1948	223	152,522	1,941,776
1949	205	127,671	1,920,240

It is heartening to note from the records of many cases, that the diagnosis of heart trouble does not mean the end of everything and that with competent medical care, many heart patients have continued to live for many years, some beyond the normal life expectancy. Of particular interest is the fact that under modern rehabilitation methods cardiacs can work when they are placed at jobs they are physically capable of doing.

The administrative problem of the Board does not solely rest in the initial adjudication of the claim but continues during the entire period of the disablement and restoration of the claimant to gainful occupation, if possible. In every phase of this vast responsibility, the physician plays an outstanding part. His responsibility, like the Board's, does not end with meeting the immediate medical needs of the claimant, but finds its way through every phase of the case until the claimant returns to physical and occupation rehabilitation.

REFERENCES

- 1 N. Y. State Workmen's Compensation Law, Section 2, subdv. 7, Section 38-48; *Lepow v. Lepow*, 288 N. Y. 377; *Harris v. Cheney Hamer Corp.*, 221 A. D. 199; *Cameron v. Ellis Construction Co.*, 252 N. Y. 394; *Copeland v. Foundation*, 256 N. Y. Rep. 568.
- 2 *Masse v. James H. Robinson Co.*, 301 N. Y. 34.
- 3 *Matter of Green v. Geiger*, 280 N. Y. 610; *Matter of McCormack*, 288 N. Y. 614; *Altschuler v. Bressler*, 289 N. Y. 463; *Bohn v. L. R. S. & B. Realty*, 289 N. Y. 808; *Godsman v. Grumman*, 295 N. Y. 708; *Brooks v. Elliott Bates*, 295 N. Y. 710; *Flammer v. Bethlehem Steel*, 295 N. Y. 817; *Cooper v. Brunswick Cigar Co.*, 298 N. Y. 731; *Ruby v. Lustig*, 299 N. Y. 259; *Lawrence v. Howard*, 276 A. D. 789; *Hathaway v. Grand Union Co.*, 275 A. D. 1013; *Kayser v. Erie County*, 276 A. D. 1090.
- 4 New York State Workmen's Compensation Law, Section 25.
- 5 New York State Workmen's Compensation Law, Section 13-13J; Rules and Procedure relative to medical and surgical care and treatment under Sec. 13-13J.

6 New York State Workmen's Compensation Law, Section 15 subd. 5-a.

7 New York State Workmen's Compensation Board-Research & Statistics, November 25, 1952.

8 New York Workmen's Compensation Board Research and Statistics.

COMMENTS

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An increasing number of important studies and surveys in regard to rehabilitation of the cardiac worker attest to a growing appreciation of this major problem. This symposium headed by eminent specialists in their respective fields has illuminated many aspects of rehabilitation. The facts indicate 1) that the largest group of disabled persons in the United States are afflicted with cardiovascular diseases; 2) that improved methods of diagnosis and clinical evaluation have increased the effectiveness of medical and surgical management and, finally, 3) that rehabilitation is now beginning to play an important role in the welfare of the individual, industry, and the nation.

COMENTARIO

El número creciente de estudios de importancia y de investigaciones sobre la rehabilitación del trabajador cardíaco, atestiguan un aumento en la estimación de este gran problema. Este simposio encabezado por eminentes especialistas en sus respectivos terrenos ha iluminado muchos aspectos de la rehabilitación.

Los hechos indicaron: 1) que la mayor parte de los inválidos en los Estados Unidos están afectados por enfermedad cardiovascular. 2) que los métodos mejorados de diagnóstico y para la evaluación clínica, han aumentado la efectividad de los tratamientos médico y quirúrgico y finalmente: 3) que la rehabilitación está empezando a desempeñar un papel de importancia para el bienestar del individuo, de la industria y de la nación.

RESUME

L'augmentation du nombre des études importantes et des recherches concernant la réadaptation au travail des cardiaques montre qu'on attache une attention de plus en plus grande à ce problème capital. Ce symposium, dirigé par des spécialistes éminents chacun dans leur domaine, a précisé de nombreux aspects de la réadaptation.

Les faits montrent: 1) que le groupe d'infirmités le plus étendu est celui des personnes atteintes d'affection cardiovasculaire. 2) que des méthodes améliorées de diagnostic et d'appréciation clinique ont augmenté l'efficacité de l'armement médical et chirurgical, et finalement. 3) que la réadaptation commence maintenant à jouer un rôle important dans l'équilibre de l'individu, de l'industrie et de la nation.

The Time Factor in Electrocardiography Following Chest Surgery*

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Introduction

Abnormalities occurring in electrocardiograms of patients who are candidates for chest surgery, and changes and abnormalities occurring after chest surgery, have been a subject of investigation for the past two decades.^{1, 5, 6, 7} However, there are conflicting reports in the literature as to the nature, frequency and significance of these changes and abnormalities.¹ On the basis of work by Bjorkman,² one might expect to find a rather high percentage of patients with tuberculosis exhibiting abnormal electrocardiograms. In a study of 476 hospitalized and 142 ambulatory tuberculous patients, he found an overall percentage of 41.4 per cent showing electrocardiographic abnormalities. He postulated that tuberculosis produces electrocardiographic changes in a manner analogous to that of rheumatic fever.

Weiss,³ in a series of 10 patients who showed a shift of the mediastinum to the left due to tuberculosis or its therapy, indicated that the observed abnormalities were due to positional changes. However, he indicated that the electrocardiographic pattern might be complicated by the effect of sub-clinical cor pulmonale.

Hertzman and Mathison¹ found five abnormal electrocardiograms and one borderline case in 68 tuberculous patients who were surgical candidates.

Guiseppe di Maria⁴ in 1951 reported on the electrocardiographic findings in 1,300 tuberculous patients who received chest surgery. He pointed up the importance of timing in relation to the post-surgical electrocardiogram, inasmuch as certain changes involving negativity of T2 and T3 and elevation of the S-T segment appeared within a few days after surgery but in the majority of cases had disappeared by the end of a month and frequently within a few days.

Weinshel et al⁵ emphasize the importance of timing by the observation that the position of the transition zone depended largely upon the position of the mediastinum which in turn varied with the interval following surgery. Immediately after surgery there is a shift to the unoperated side and later to the operated side. They also pointed out that a resulting shift in the transition zone may be reflected not only in the usual QRS changes but also by the inversion of the T-waves in V2 and V3 in some cases and

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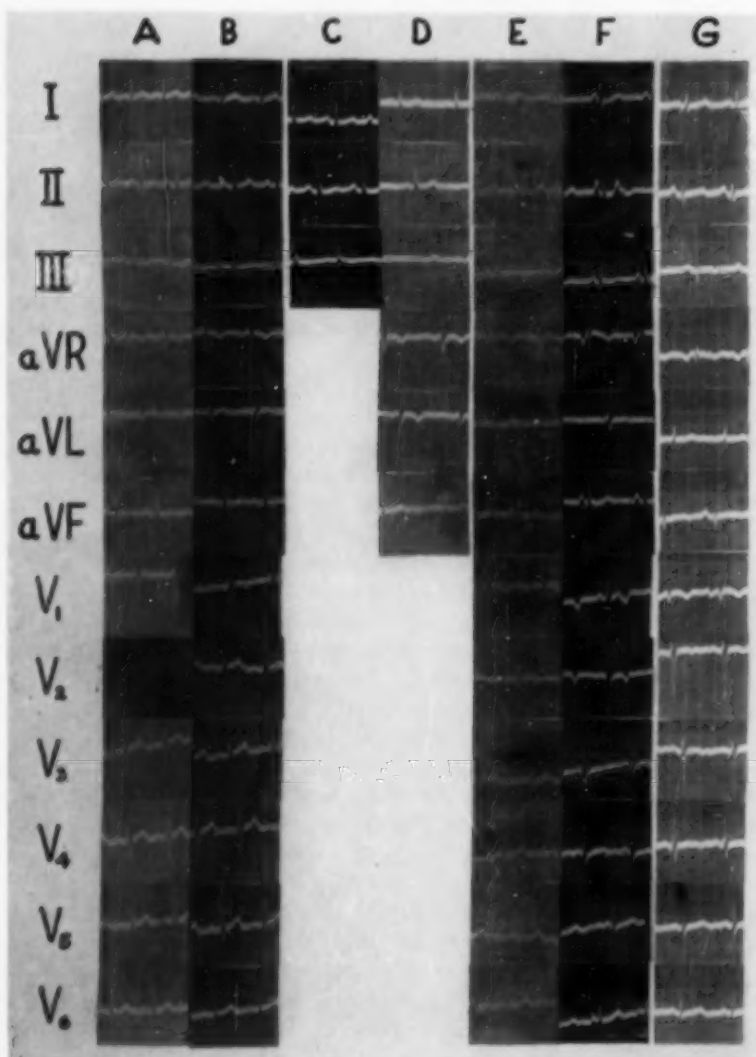


FIGURE 1. A and B: pre-operative and post-operative (three months) electrocardiograms on patient A. H., 24 year old female, who received a left segmental resection—showing no change. C and D: showing pre-operative electrocardiogram taken February 24, 1943 on patient M. S., 39 year old female, just prior to right thoracoplasty and post-operative tracing on October 30, 1953—then 50 years of age—both are normal. E and F: Pre- and Post-operative electrocardiograms on patient H. T., 32 year old female, who received a right schede thoracoplasty. The pre-operative tracing is normal and the post-operative tracing shows peaked P-waves, blocked auricular premature beats in lead II, flattening of T-waves in V2, decreased voltage in V3, V4 and V5. These changes are assumed to be due to atrial damage and pericarditis. G: Electrocardiogram taken six years post-operative on patient L. D., 47 year old female, who has shown progressive cardiac enlargement of undetermined etiology. The tracing shows flattened T-waves in chest leads. This patient's clinical picture and EKG findings are not compatible with cor pulmonale (See Fig. 2).

that this had to be differentiated from the pattern of chronic arterial insufficiency.

It would appear from the literature that results based on electrocardiograms done shortly after surgery would differ from those based on electrocardiograms taken a month or more later. Other factors that have bearing on different results obtained by various investigators would be the type of surgery, post-surgical complications, the age factor and individual variations in electrocardiograms. We have analyzed our own experience over the past 10 years and are reporting the results in an attempt to clarify some of the conflicting observations and conclusions.

Methods

Electrocardiograms were performed upon 95 individuals, all of whom were candidates for or who had received chest surgery. There were 95 pre-operative electrocardiograms, 47 of which included the standard limb leads, the V leads, and augmented limb leads. The remaining 48 had standard limb leads and CF4. There were 89 post-operative electrocardiograms performed on 79 individuals. All of these included the standard limb leads, V leads and augmented limb leads. In 28 cases electrocardiograms were done two to 10 years after chest surgery to determine the effect of time. In 10 cases there were repeat tracings on the same individuals after a year or more to determine whether there were subsequent changes in the original post-operative pattern. In 51 there were post-operative tracings one to four months following the completion of chest surgery, and these were compared with the pre-operative tracings. All of these patients had either moderately or far advanced pulmonary tuberculosis. There were 58 women and 37 men. These were Negroes on the wards or attending the chest clinic of the Tuberculosis Annex of Freedmen's Hospital.

Of the 79 receiving post-operative studies 50 had thoracoplasty, 21 lobectomy, four pneumonectomy and four pneumoperitoneum.

RESULTS

Pre-Operative Electrocardiograms (95 cases)

There was one significant abnormality observed in the electrocardiograms of 95 individuals with pulmonary tuberculosis who were candidates for chest surgery. This consisted of inversion of V4 with flattening of V5 and V6. Improvement in the electrocardiogram occurred after surgery.

Post-operative Electrocardiograms

The results in the immediate post operative group are summarized in Table I.

It may be seen from this table that the bulk of the changes involved the T-wave and that there was one patient whose electrocardiogram became abnormal following chest surgery. The pre- and post-operative electrocardiograms are reproduced in Fig. 1, E and F.

TABLE I
CHANGES OCCURRING IN POST-OPERATIVE ELECTROCARDIOGRAMS (1-4 MONTHS) AS COMPARED TO PRE-OPERATIVE ELECTROCARDIOGRAMS

Procedure	P-Wave	Electrical Position	Transition Zone	Axis Deviation	T-Wave	Abnormal EKG
Pneumonectomy (4 Cases) No. Cases showing change (2)		More vertical (1)	Marked Shift to right (1) See Fig. 3			
Left lobectomy and segmental resections (9 cases)			Shift to right (2)		Upright to biphasic T-III and inverted T V ₆ , T V ₅	
No. cases showing change (7)			Shift to left (2)		T aV1 and T aVF (1) biphasic T-III to upright (1) inverted T-III to iso-electric (1)	
					Upright T-III to inverted (1) Upright T aVL to inverted (1)	
Right lobectomy and segmental resections (10 cases)	Upright to inverted P-III (1)	More Horizontal (3)	Shift to left (2)	Normal to Right	Increased amplitude T V ₆ , T V ₅ , and T V ₄ (1)	
No. cases showing change (7)	Increased amplitude P-II & P-III (1)				Increased amplitude T V ₆ and T V ₅ (1)	
Right Thoracoplasty (11 cases)	Increased amplitude P-II	More Horizontal (1)	Shift to left (1)	Left to Normal (1)	Upright to inverted T V ₆ , T V ₅ , and T V ₄ (1)	Normal to Abnormal (1) See Fig. 1, E & F
No. cases showing change (5)	P-III and PaVe (1)		Normal to left (1)		Upright to inverted T-II, T-III and T aVL (1)	
					Inverted to upright T V ₆ and flattening in T V ₅ and T V ₄	

Left Thoracoplasty (13 cases)	Increased amplitude in P-II, P-III and PaVf (1)	Shift to right (1)	Normal to right (1)	upright to inverted T V ₁ , T V ₂ , T V ₃ , and T aVL
Cases showing Change (6)				
Pneumoperitoneum (recumbent) 4 cases				
No. cases showing change (0)				
Left Thoracoplasty 9 cases		Shift to the left (1)	Normal to left (1)	Increased Amplitude T-I, T-II, T V ₁ , T V ₂ , (1)
Cases Showing change—3				
Right Thoracoplasty (17 cases)	Upright to in- verted P V ₁ , P V ₂ , P V ₃ , P V ₄ , and PaV ₁ (1)	Shift to left (3)	Normal to right (1)	Upright to inverted T-I, T-II with increased amplitude of T V ₁ and T V ₂ , (1)
Cases showing Change (9)	Increased amplitude P-II and P-III (1)			Upright to biphasic T V ₁ , T V ₂ , and T V ₃ , (1)
				Increased amplitude of T-I, T-II, T V ₁ , T V ₂ , T V ₃ , (1)
Lobectomy 2 cases				Normal to Abnormal EKG (2)
Cases showing Change—0				(See Fig. 1-G and Patient R. P. in text)

The late post-operative electrocardiographic findings are summarized in Table II.

Comparison of a Repeat Post-Operative Electrocardiogram After One or More Years with the Original Post-Operative Electrocardiogram (10 Patients)

There was an increase in amplitude of the P-wave in leads II and III in one case with a right thoracoplasty and a shift of the transition zone to the left in three other patients with thoracoplasty. No other significant changes were noted.

Comparison of the Anatomical with the Electrical Position in 10 Patients whose Cardiac Position Changed Following Surgery.

There was correspondence between the anatomical and electrical axes in four cases and lack of correspondence in six cases.

The Age Factor

The 79 patients with post-operative studies had a mean age of 31.5 with a median of 30 years. There were 15 of these who were 40 years of age or above. Five of these 15 showed electrocardiographic changes. Thirty-nine of 64 under 40 years showed some electrocardiographic change post-operatively.

DISCUSSION

Electrocardiogram Prior to Chest Surgery

We found only one patient in 95 with an abnormal electrocardiogram prior to chest surgery. The element of selection, the age factor (median

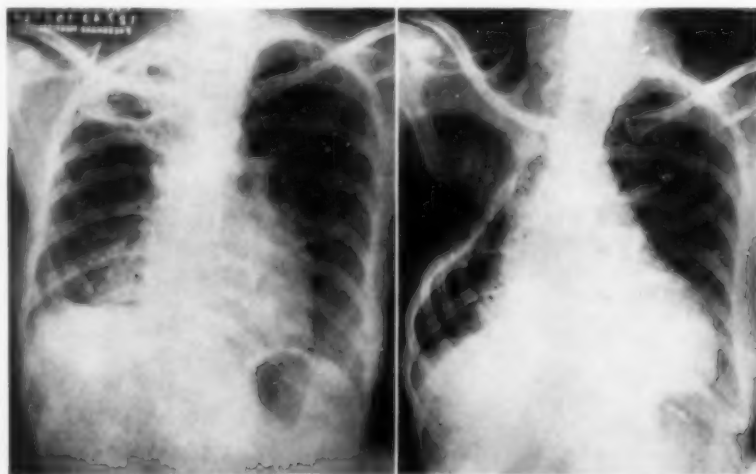


FIGURE 2: Chest films on patient L. D. (G in Fig. 1) taken December 7, 1943 showing tuberculous cavity in right upper chest and normal heart size. Recent chest film on May 24, 1954 shows right thoracoplasty and marked increase in cardiac size. The enlargement is primarily to the left.

age 30), different points of view as to what constitutes an abnormality would account in part for the discrepancy between our results and those of Bjorkman. However, the prevalence of electrocardiographic abnormalities in patients with pulmonary tuberculosis deserves further study.

In our cases, electrocardiographic studies were done one to four months following surgery in one group. In addition, we had 10 who had repeat tracings one or more years following chest surgery in which the results were not significantly different from the original tracings.

P-wave: There was no consistent change in the thoracoplasty or resection groups. The most common change was a decrease in the amplitude of the P-wave in lead I and aVI and an increase in amplitude in leads II and III and aVI.

Winshel et al⁵ had similar findings. They indicated it might be related to a more vertical position of the heart associated with a tendency of P-I and Pa-VI to become flatter or inverted and P-III and PaVf to become taller. Hertzman and Mathison¹ reported no significant change in P-wave as did Rauchwerger and Erskine. Di Maria⁴ noted changes in P-wave (concealments and increases, notches or hooks) in 6.2 per cent of his cases. P. Biocca et al,⁷ in 50 cases of resection involving non-tuberculous conditions, found alterations in the P-wave in eight cases consisting of increased voltage in almost all the derivations especially V1 and V2. They felt that these changes, while difficult to interpret, were due to slight atrial damage during operative maneuvers connected with ligation of the pulmonary vessels. In this connection, the observation of Stein and Brickberg⁸ that manipulations on the hilum do not produce the effect on the electrocardiogram that theoretical considerations would lead one to expect is of interest. Their observation was based upon electrocardiograms taken while chest surgery was being performed.

Electrical Position: In four of the five cases in our series of 51 showing change in electrical position, they became more horizontal and the other case became more vertical. This differs from the findings of Hertzman and Mathison¹ (more horizontal in 13 of 42) and Weinshel et al⁵ (24 more horizontal out of 45) only in respect to the per cent of patients showing change in electrical position. The overall tendency in these studies including ours is towards a more horizontal position where a change in the electrical position occurs.

G. di Maria⁴ made what he considered to be an important observation that the electrical axis rather rarely coincides with anatomical positions as checked radiologically. This is in contrast to the view of Weinshel et al⁵ that many of the changes in electrical position were readily correlated with similar changes in anatomic position as evidenced by roentgenographic control.

In 10 of our cases in which there was change in the electrical or anatomical position or both, we found correlation in four and a lack of correlation in six.

Studies by Grant⁹ on the relationship between anatomical position of the heart and the electrocardiogram indicate that the actual rotation



FIGURE 3: Pre- and Post-operative chest film on patient E. P., 30 year old female who had right pneumonectomy with shift of the entire heart and mediastinum into the right chest. Chest leads taken in the conventional positions are all over the left ventricle with resultant tall R wave in V₁ and V₂. Bi-polar and uni-polar leads show little change either in axis deviation or in electrical positions of the heart.

of the heart on its long axis rarely, if ever, occurs and unipolar criteria for position and rotation of the heart have little validity. In the case of cor pulmonale in his series, there was no significant anatomical rotation of the heart. The changes seen, interpreted as vertical axis, were said to be due to the larger epicardial surface area and increased thickness of the wall of the right ventricle. "This would cause epicardial vectors from the right ventricle to be increased in magnitude and slightly delayed in time causing the main QRS vectors to have a more rightward direction than normal." None in his series, however, had marked displacement in the mediastinum, nor had they undergone any significant chest surgery.

In one with right pneumonectomy there is marked shift of the mediastinum to the right on x-ray film. The chest leads indicate this shift by change in transition zone, but there is no change in the electrical axis or electrical position as seen in the unipolar limb leads. If these changes were interpreted without reference to cardiac position, they might be erroneously interpreted as evidence of either right ventricular hypertrophy or myocardial disease. (See Fig. 3) this would tend to support the statement by Grant that changes in the electrical position would not necessarily correspond with changes in anatomical position.

Transition Zone: There were five cases showing shift to the right and five showing shift to the left. We recognized no consistent pattern either with resection or thoracoplasty. Weinschel and his group⁵ believed that the transition zone depends largely upon the position of the mediastinum and we are in agreement with this point of view.

T-Wave and S-T Segments: There were T-wave changes in 22 per cent of our cases. The most common changes involved inversion and increased amplitude. These changes occurred in the standard limb leads as well as the V leads. We found no change involving the S-T segments.

In the early report on this subject,⁶ inversion of the T-wave in the CF4 leads were stressed and also in the standard limb leads. It is now recognized that these studies were of limited value because of the restricted number of leads used.⁵

P. Biocca et al⁷ found alterations in the S-T segment and T in 52 per cent of his cases. They indicated that the early alterations in these segments should be interpreted as being due to pericarditis on the basis of these considerations: "(1) The morphology of the tracing is absolutely typical for a picture of acute pericarditis; (2) in the one case in which these alterations were particularly evident, a purulent pericarditis was found in the autopsy; and (3) the precocity and temporary nature of the electrocardiographic finding agrees with the hypothesis of a pericardial inflammation of rapid course."

On the other hand, G. di Maria⁴ found normalization of S-T and T tracts in a few cases following surgery (thoracoplasty). However, he too found elevation of the S-T with negativity of T2 and T3 in 40 per cent of his patients occurring shortly after surgery but gradually disappearing, usually within a week and not longer than a month. He states that in those

having a difficult post-operative course ending in death, this restoration of normal appearance did not occur.

Weinshel and his group⁵ indicated that the T-wave changes were commensurate with the QRS deflections in most instances and that the changes in lead CF4 were due to the influence of the left leg.

Pollack's¹⁰ observations with reference to T-wave changes in pneumoperitoneum were in accord with Goldberger's¹¹ view that inversion of T in aV1 or aVF when the QRS is directed upward is not necessarily indicative of myocardial damage as advocated by Seney.

Further, Hertzman and Mathison¹ state that in evaluating patients who have had collapse therapy for additional surgery, the findings of a low or flat T-wave in the presence of a clinically normal vertical heart should not be considered as indicating myocardial damage.

While it is true that P. Biocca⁷ and his group worked only with cases of resection, and those observers^{1, 5} who regard T-wave changes as reflecting positional changes primarily worked with cases of thoracoplasty as well as resection, this fact does not explain the conflicting viewpoints. It is significant that P. Biocca et al⁷ and G. di Maria⁴ did electrocardiographic studies within hours to a week following surgery and they note that the S-T elevation tends to return to normal within a period of days but the T-wave changes may persist up to a month or longer. The probable reason that we and others have not noted the S-T changes is that our electrocardiograms are performed more than a week post-operatively. This, too, would account for some discrepancy in the reported frequency of T-wave changes. Furthermore, these observations of the Italian investigators^{4, 7} tend to lend some support to their concept that the S-T and T changes are probably incidental to pericardial involvement.

In our own series we felt that the T-wave changes could be explained on the basis of positional changes of the heart resulting from surgery in all cases except one. In this particular case, intrapleural pneumonectomy was first attempted but failed because of dense and numerous adhesions. Subsequently a Schede type thoracoplasty was performed on the right side. The pre- and post-operative electrocardiograms are shown in Figure 1 E and F. There was a stormy post-operative course that might have been compatible with pericarditis, although the diagnosis was not made at the time. However, the post-operative electrocardiogram shows what appears to be evidence of pericarditis and myocardial damage. Here we believe that the possibility of pericarditis and resulting myocarditis occurring in some instances in relation to chest surgery, as contended by P. Biocca and his associates,⁷ deserves further investigation.

Axis Deviation: In our series of cases, normalization of the axis occurred as frequently as the reverse following chest surgery. This is in keeping with the recognized effect of cardiac position upon axis deviation.

Long Term Effect of Chest Surgery Upon Electrocardiographic Findings

In view of the fact that there were no significant changes in our serial post-operative electrocardiograms, one could assert that those changes due

to chest surgery and present one month after chest surgery are apt to persist. This assertion must be qualified by the fact that our series was small and a larger group is necessary in order to validate it.

When we consider our two to 10 year group of cases, it is interesting to note that although we had two of 28 patients exhibiting electrocardiographic evidence of heart disease, neither one was compatible with cor pulmonale. There is no agreement in the literature concerning the occurrence of acute cor pulmonale in relation to chest surgery. Some authors^{12, 13} have reported changes compatible with acute cor pulmonale under certain conditions and others^{14, 15} have been unable to confirm these. These changes are said to be transitory and frequently return to normal in a matter of hours. However, Stein and Buchberg⁸ fail to mention changes suggestive of cor pulmonale in their tracings taken during chest surgery. Here again the time element is important and the specific conditions under which surgery is done may have some bearing on the contradictory findings.

We did not expect, or did we see, any electrocardiographic evidence of acute cor pulmonale because our studies were done at least a month after surgery was completed. We were searching for evidence of chronic cor pulmonale on the basis of findings by Medlar¹⁶ and others¹⁷ indicating that thickening of right ventricular wall has been found in old thoracoplasty patients when examined at autopsy. One of our patients who developed heart disease following chest surgery did so after developing hypertension. His hypertension developed about four years after completion of chest surgery. The heart disease is presumably due to hypertension. The other patient has shown progressive cardiac enlargement with electrocardiographic evidence of myocardial damage, however, there is no evidence that it is compatible with pulmonary heart disease. No definite etiology has been established (See Fig. 1-G and Fig. 2).

The question as to the relationship between chest surgery and chronic cor pulmonale is one that apparently requires a larger series of cases and perhaps a longer period of post-operative follow-up than was true of our cases.

Inasmuch as only five of the 15 patients over 40 years of age showed electrocardiographic changes following chest surgery, we did not feel that age or degenerative heart disease was an important factor in the results obtained.

SUMMARY

Review of pre-operative electrocardiograms on 95 patients with pulmonary tuberculosis who were candidates for chest surgery revealed one abnormal electrocardiogram. Comparison of the pre-operative and post-operative electrocardiograms (one to four months after completion of surgery) of 51 indicated that approximately 50 per cent showed some electrocardiographic changes. Only one, however, had an electrocardiogram indicating myocardial disease and it was compatible with pericarditis and myocardial damage. In all of the others the differences noted could apparently be explained by positional changes in the heart and mediastinum.

Analysis of electrocardiograms on 28, two to ten years following chest surgery, showed that two had evidence of heart disease, neither of which were compatible with the findings in pulmonary heart disease. It is pointed out that electrocardiographic findings without reference to cardiac position may be misleading with reference to the existence of right ventricular hypertrophy.

The importance of the time factor in explaining many of the divergent reports on the frequency and nature of electrocardiographic findings following chest surgery is stressed.

RESUMEN

La revisión de los electrocardiogramas de 95 enfermos de tuberculosis pulmonar candidosa, la cirugía de tórax reveló uno anormal. La comparación de los electrocardiogramas pre y postoperatorios (de uno a cuatro meses después de realizada la operación) en 51 casos, indicó que en el 50 por ciento había cambios electrocardiográficos. Sin embargo, sólo uno tuvo un electro que indicaba afección miocárdica en relación con pericarditis y daño del miocardio. En todos los demás las diferencias descubiertas podrían en apariencia explicarse por cambios de posición del corazón y del mediastino.

El estudio del electrocardiograma en 28 casos, dos por 10 años después de la operación, mostró que dos tenían evidencias de afección cardíaca, ninguno de los cuales estaría en relación con los hallazgos en corazón pulmonar. Se señala que los hallazgos electrocardiográficos sin tener en cuenta la posición del corazón son engañosos respecto de la presencia de hipertrofia ventricular derecha.

La importancia del factor tiempo para explicar muchos de los informes divergentes sobre la frecuencia y la naturaleza de los hallazgos electrocardiográficos después de cirugía de tórax, se recalca.

RESUME

La revue des électrocardiogrammes précopératoires, pratiqués sur 95 malades atteints de tuberculose pulmonaire, et justiciables de chirurgie thoracique, révèle un électrocardiogramme anormal. La comparaison des électrocardiogrammes préopératoires et postopératoires (faits de un à quatre mois après l'intervention) de 51 malades indique qu'environ 50% d'entre eux montraient quelques modifications électrocardiographiques. Cependant un seul eut un électrocardiogramme indiquant une atteinte myocardique évoquant une péricardite ou une altération myocardique. Dans tous les autres, les différences notées pouvaient apparemment être expliquées par les modifications des positions du coeur et du médiastin.

Une analyse des électrocardiogrammes de 28 malades, pratiqués de 2 à 10 ans après intervention chirurgicale thoracique, montre que deux avaient de toute évidence une affection cardiaque, sans qu'aucune ne puisse être rattachée à une cardiopathie d'origine pulmonaire. Les auteurs insistent sur le fait que les constatations électrocardiographiques peuvent

faire penser à tort à l'existence d'une hypertrophie ventriculaire droite, si on ne sait pas les attribuer à la position du cœur.

L'importance du facteur temps peut expliquer les divergences notées sur la fréquence et la nature des constatations électrocardiographiques après une intervention thoracique.

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The Artificially Produced Stomach Bubble

A Radiographic and Cineradiographic Aid In the Study of Cardiomegaly

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The degree of cardiac enlargement demonstrated by post-mortem is sometimes surprisingly greater than that revealed by ante-mortem clinical examinations, including routine roentgenography of the chest. Such discrepancies occur most commonly in instances of downward enlargement of the left ventricle. It is usually not difficult by routine roentgenologic methods to detect enlargement of the left ventricle in a lateral or posterior direction. But when an element of downward enlargements exists, either alone or in combination with lateral or posterior enlargement, it is sometimes undetectable by the usual x-ray technique. The shadow produced by the downwardly enlarged portion of the heart is merged with the subdiaphragmatic density produced chiefly by the stomach; thus, because of the absence of contrasting densities, its shadow cannot be observed. It would appear that this explanation accounts for the difference in some cases between the clinical impression of the heart size and the actual cardiac measurements at autopsy.

In order to facilitate x-ray visualization of the subdiaphragmatic region into which a portion of the cardiac shadow may extend, several investigators¹⁻⁴ have suggested the use of a seidlitz powder drink, which produces enough gas in the fundus of the stomach to provide adequate roentgenographic contrast. The shadow of the downwardly enlarged segment of the heart may then be seen clearly through the gastric bubble. While this method yields satisfactory results from the x-ray standpoint, it has the serious disadvantage of producing a strong laxative effect, making it undesirable as a routine office procedure. Fortunately, the same roentgenographic results may be obtained without catharsis merely by substituting a commercial carbonated drink for the seidlitz powder.

Material and Technique

The patient drinks seven ounces of a commercial carbonated beverage such as soda water or ginger ale, slowly and without eructation. A routine posterior anterior chest film is made immediately. Following this other views of the heart may be taken or fluoroscopy may be performed if indicated. On the posterior anterior film, measurements of the long, transverse and broad diameters of the heart were made, and the area of its frontal plane was plotted on a square grid in certain instances. In 12 patients,

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cineradiography was performed with the Philips intensifier radiographic unit to study the movements of the caudal surface of the heart.

Roentgenographic studies of the heart with the aid of the gastric bubble were made in 180 patients. These included persons with normal hearts (98) and cases of congenital, rheumatic, hypertensive, and arteriosclerotic heart disease. There were no adverse objective or subjective results from this method of investigation.

Findings

In nearly all instances, a satisfactory gas bubble was produced; usually measuring 8-12 cm. in diameter, lying immediately below and clearly outlining the left leaf of the diaphragm (Fig. 1). The bubble was not considered satisfactory if it failed to extend beyond the left cardiac border and below the inferior cardiac border. In a few cases, the bubble failed to provide adequate contrast because of prior ingestion of food which produced confusing shadows. In a few others, the soft-tissue shadow of enlarged spleen merging with the shadow of the lowermost portion of the heart interfered with clear visualization of this part of the heart, and in a few the air bubble was poorly seen because of pendulous breasts.

In order to determine whether the gas bubble would tend to elevate the diaphragm, lift the heart upwards and thus invalidate cardiac measurements, roentgenograms were made before and after ingestion of seven

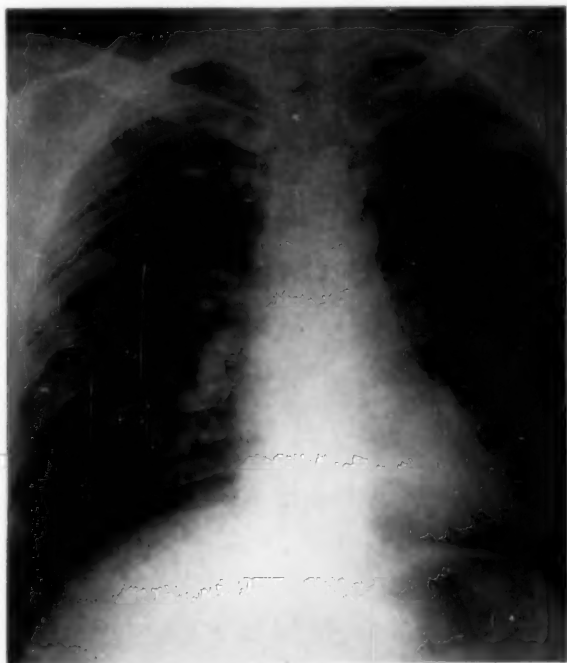


FIGURE 1: Posterior anterior film showing normal heart. There is no extension of the cardiac shadow into the stomach bubble.

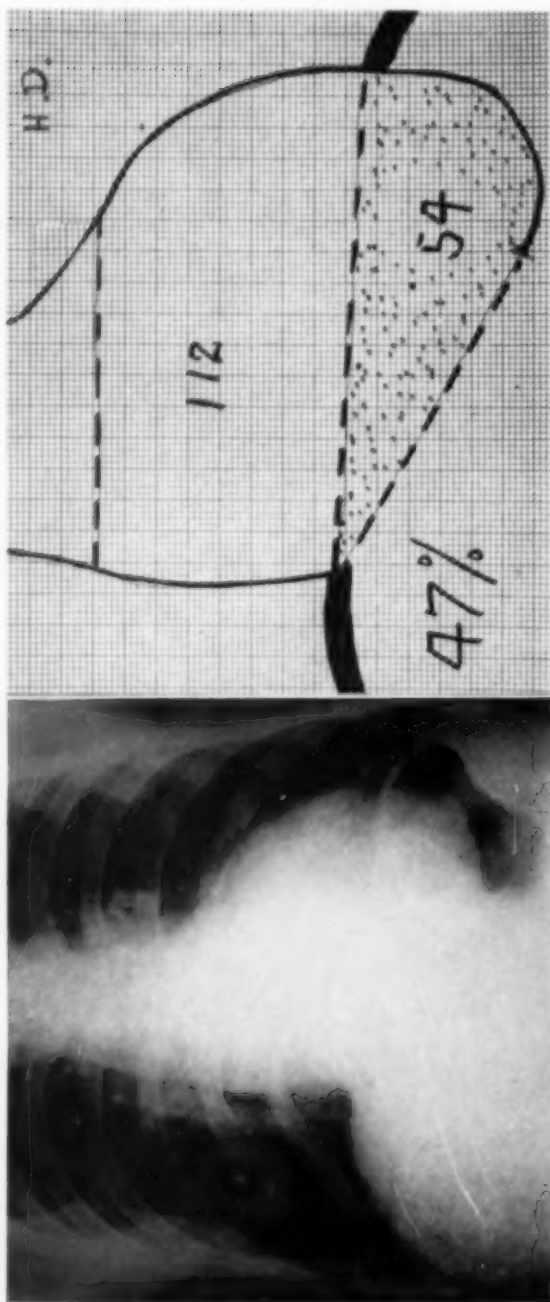


FIGURE 2A

FIGURE 2B

Figure 2: A 56 year old male with history of previous myocardial infarction and hypertension (Fig. A). Posterior anterior film with stomach bubble demonstrates a large portion of the left ventricle extends into the stomach bubble. When studied fluoroscopically with the stomach bubble present a major portion of the downward enlargement was thought to be due to a ventricular aneurysm. This part of the ventricle showed paradoxical pulsation. At a previous fluoroscopy without a stomach bubble this part of the heart could not be seen and the paradoxical pulsation was not appreciated. (Fig. B) Diagram of posterior anterior roentgenogram (Fig. 2A) traced on sq. cm. ruled paper demonstrates 112 sq. cm. of the frontal plane of the heart above the level of the dome of the diaphragm. Stippled area of 54 sq. cm. of the heart can be clearly seen through the gastric air bubble lying below the level of the dome of the diaphragm. Therefore approximately 47 per cent more of the frontal plane area of the heart can be visualized by utilizing the gastric air bubble.

ounces of the carbonated drink. Measurements of the level of the diaphragm and heart failed to show significant change in position of this organ after the gas bubble was produced.

1. Normal-sized Hearts:

The lower margin of the heart could usually be visualized with the aid of the gas bubble (Fig. 1). In only a few instances, however, did any portion of the heart appear below the level of the diaphragmatic shadow. In other words, the unenlarged heart seldom produces any roentgen defect in the stomach bubble.

2. Enlarged Hearts:

Stomach-bubble roentgenographs were made in 82 patients with cardiac enlargement. Satisfactory visualization of the inferior portion of the heart was obtained in 57 of them.

In 10 of the latter, who showed a large portion of the heart shadow lying below the shadow of the diaphragm, the frontal plane of the cardiac silhouette was plotted and measured on a square grid. The total surface area of this plane, and the area of the portions lying above and below the diaphragmatic shadow were then calculated. The results of these studies showed that the frontal surface area of the cardiac shadow seen with the aid of the stomach bubble was from 16 to 46 per cent larger than the area visible on routine films. This means that in the 10 patients thus studied, 14 to 32 per cent of the total frontal plane area was obscured in the routine examinations and was revealed only after films were made in the presence of the stomach bubble (Figs. 2 and 3).

Three diameters of the heart shadow, transverse, long and broad, were

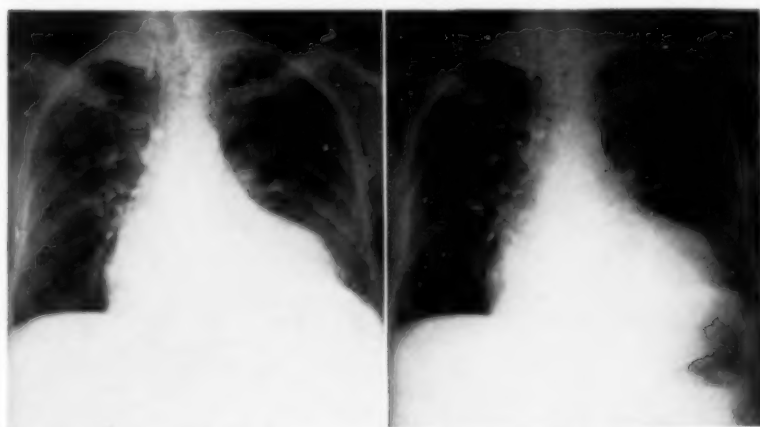


FIGURE 3A

FIGURE 3B

Figure 3: Posterior anterior roentgenograms before (A) and after (B) production of an artificially produced gastric bubble in a 62 year old male with hypertensive cardiovascular disease. He previously had splenectomy with subsequent elevation and fixation of the left dome of the diaphragm, the high diaphragm hiding a major portion of the enlarged left ventricle. The extent of ventricular enlargement is clearly visualized through the stomach bubble (B).

studied and compared on films made before and after the production of the stomach bubble. It was found that no difference in the length of the transverse diameter resulted from the presence of the bubble. In one instance only there was a significant change in the long diameter (Fig. 4), and in no case was there an appreciable difference in the length of the broad diameter. The direction of both the long and broad diameters, however, was often slightly altered since the true position of the cardiac apex as seen through the bubble was different from the assumed apical position on the routine films.

Thus, although the frontal surface area of the heart was seen to be from 16 to 46 per cent larger than suspected from routine roentgenography, the diameters of this surface were rarely altered when measured with the stomach bubble present. The constancy of these diameters would seem to indicate (1) that the shape of the cardiac silhouette is not changed by the presence of the bubble and (2) that the border of the apex of the heart visible through the bubble constitutes an arc of a circle (Fig. 5). The single instance in which the long diameter increased as measured after the bubble was produced was a case of ventricular aneurysm, in which the

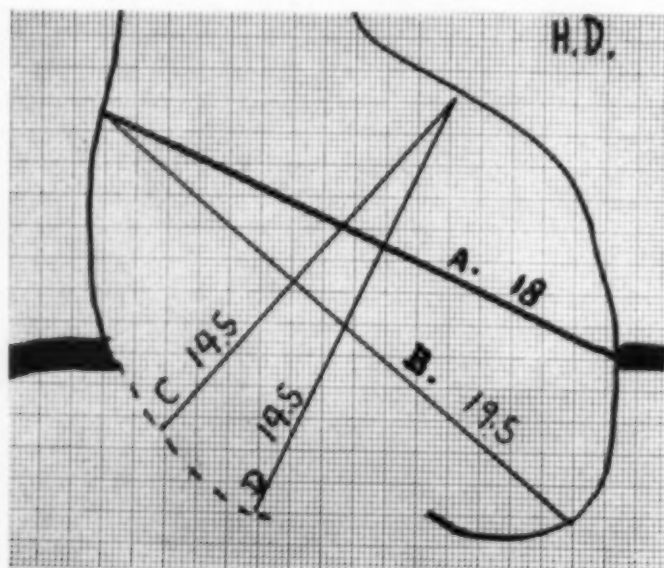


FIGURE 4: Diagrammatic illustration of roentgenogram of Fig. 2A demonstrating long and broad diameters measured before and after the production of the gastric bubble. A is the long diameter measured without the aid of a gastric bubble considering the apex at the junction of the left cardiac border and the dome of the diaphragm. B is the long diameter as drawn to the true cardiac apex visualized through the stomach bubble. The difference between A and B (1.5 cm.) is larger than seen in our other cases. The broad diameter (C and D) remain the same in size although they differ slightly in direction. Usually the transverse, long and broad diameter remain the same although total surface area is often enormously increased with the aid of a gastric air bubble.

shadow seen through the bubble was obviously not a circular arc (Fig. 4).

Of the 57 enlarged hearts studied satisfactorily with the aid of the stomach bubble, nearly all of those which exhibited enlargement extending below the diaphragmatic shadow were of hypertensive or arteriosclerotic etiology. The downward enlargement in these cases was uniform, giving in most instances a rounded contour to the apex, as suggested above. In the patient with ventricular aneurysm, fluoroscopic examination revealed paradoxical pulsation of the apical region, seen through the stomach bubble (Fig. 2). The presence of this important diagnostic sign and the cardiac enlargement was not even suspected from previous, routine fluoroscopy.

In contrast to the frequent downward enlargement seen in hypertensive and arteriosclerotic heart disease, the hearts of patients with rheumatic mitral valve disease seem rarely to project downwards even when enormously enlarged in other directions (Figs. 6 and 7). In view of the different pathological processes in these types of disease, such a finding is not unexpected. In rheumatic mitral disease, the preponderant right ventricular enlargement results in displacement of the right cardiac border to the right or posteriorly, causing backward and upward displacement of the cardiac apex. On the contrary, where left ventricular enlargement predominates, as in hypertensive and arteriosclerotic hearts, the main enlargement is downward and to the left.

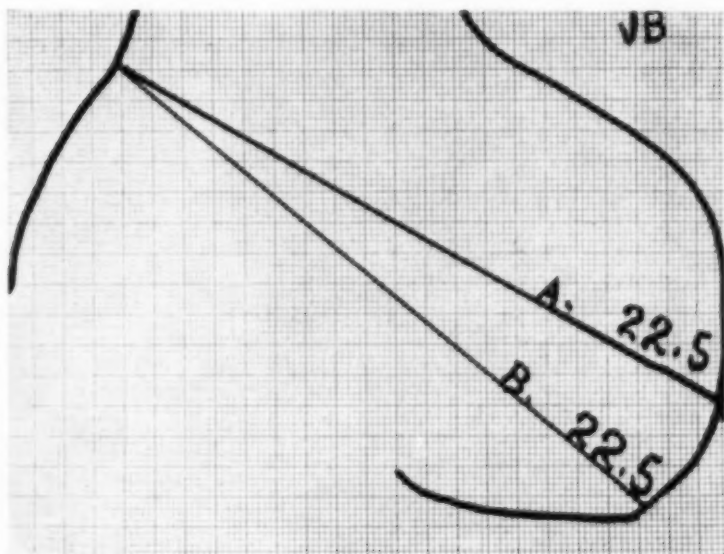


FIGURE 5: Diagram of the outline of the heart made from roentgenogram after production of a gastric bubble to demonstrate long diameters of the heart. The long diameter (A) measured without the aid of the gastric bubble to the assumed cardiac apex (junction of left heart border and the diaphragm) does not differ in length from long diameter B (drawn to the true apex as visualized through the stomach bubble).



FIGURE 6: Posterior anterior film of a 30 year old male with marked cardiomegaly due to rheumatic heart disease, considered to be primarily mitral stenosis. An aneurysmal dilatation of the left auricle makes up most of the cardiac silhouette. No left ventricular enlargement could be demonstrated fluoroscopically and the stomach bubble film shows no evidence of downward prominence of the left ventricle.

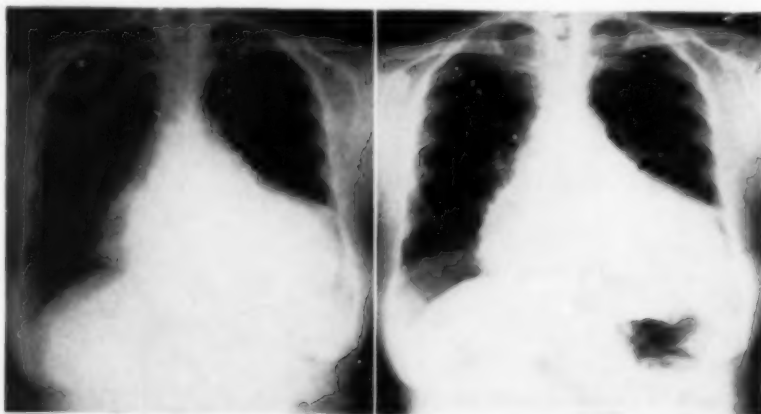


FIGURE 7A

FIGURE 7B

Figure 7: Posterior anterior film of a 53 year old female with rheumatic heart disease. The clinical findings indicating stenosis and insufficiency of the mitral and aortic valves. When studied fluoroscopically and by oblique films both ventricles are prominent, the left being enlarged primarily in the posterior direction and not downward. No significant portion of the left ventricle extends into the stomach bubble.

*The Value of the Stomach Bubble in Serial
Roentgenography for Heart Size*

One of the common problems in serial roentgenographic comparisons of cardiac size is variability of the height of the diaphragm in different films. In routine films it is obvious that more of the heart is hidden by the diaphragm during deep expiration than during the most intense inspiratory effort; a large portion of the heart may remain obscured in some patients with enlarged left ventricles. However, in the presence of a gastric bubble which provides visualization of the previously hidden portion of the heart, the surface measurements of the heart are identical whether made during deep inspiration or deep expiration. Thus, by the use of the bubble, the true arc of the cardiac surface may be seen regardless of the height of the diaphragm (Fig. 3). In this way, the importance of one of the technical variables in comparative serial studies of heart size may be greatly minimized.

SUMMARY AND CONCLUSIONS

A simple roentgenographic method has been described as an aid in visualization and measurement of the lower portion of the anterior cardiac surface and borders. This method consists of x-ray and fluoroscopic examination of the heart after artificial production of a stomach bubble by carbonated beverages.

In some patients with enlarged hearts, examination with this technique disclosed as much as one-third of the total anterior surface area of the heart which was not visualized on routine chest films. The stomach bubble not only revealed the true size of these hearts, which previously had been erroneously estimated but also disclosed the true contours of the inferior and apical segments.

In addition the stomach bubble permits more adequate fluoroscopic examination of the heart, especially in those cases in which a portion of the left ventricle is enlarged downward. The heightened roentgenologic contrast facilitates examination of the cardiac pulsations of this part of the heart and aids in the search for intracardiac and pericardial calcification.

It is suggested that this method of examination be used routinely to study and follow the progress of diseased hearts.

The authors wish to thank Darline Bay, Bernice Howell, Rosemary Fredburg, Marjorie Guterman and Viola Olenick who so kindly assisted in this study.

RESUMEN

Se ha descrito un método sencillo roentgenográfico que es una ayuda para la visualización y medición de la parte inferior de la superficie anterior del corazón y sus límites. Este método consiste en el examen fluoroscópico del corazón después de insuflación del estómago mediante ingestión de bebidas gaseosas carbonatadas.

En algunos enfermos con corazones crecidos, el examen con esta técnica dejó ver hasta $\frac{1}{3}$ de 1 total de la superficie anterior del corazón que no se

percibía por las radiografías comunes. La ampolla gástrica no sólo reveló el tamaño verdadero de estos corazones que antes de habían apreciado erróneamente sino que también descubrió el contorno verdadero de los segmentos inferior y apical.

Además la cámara gástrica insuflada permite un examen fluoroscópico más adecuado del corazón, especialmente en los casos en que una porción del ventrículo izquierdo está crecida hacia abajo.

El contraste radiológico aumentado, facilita el examen de los latidos cardíacos de esta parte y ayuda en la investigación calcificaciones intra-cardíacas o pericárdicas.

Se sugiere que se use este método como de rutina en el estudio de la evolución del corazón enfermo.

RESUME

Les auteurs ont décrit une méthode radiographique simple pour permettre l'observation et la mensuration de la partie inférieure de la surface cardiaque antérieure et de ses contours. Cette méthode comporte la radiographie et l'examen radioscopique après production artificielle d'une insufflation gastrique par des boissons dégageant du gaz carbonique.

Chez quelques malades, au coeur volumineux, l'examen par ce procédé permit de découvrir au moins un tiers de la totalité de la surface antérieure du coeur, qui n'était pas visible sur les films habituels. L'insufflation gastrique révéla non seulement la taille véritable de ces coeurs, qui primitivement avait été faussement estimée, mais permit en outre de dessiner les véritables contours des segments inférieurs et apicaux.

De plus, l'insufflation gastrique donne un aspect radioscopique du coeur plus précis, particulièrement dans les cas où une partie du ventricule gauche est hypertrophiée vers le bas. Le contraste radiologique augmenté facilite l'examen des pulsations cardiaques de cette partie du coeur et aide la recherche des calcifications intracardiaques et péricardiaques.

Les auteurs suggèrent que ce procédé d'examen soit utilisé couramment pour étudier et suivre l'évolution des affections cardiaques.

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Relief of Carbon Dioxide Narcosis by Simple Intermittent Positive Pressure Therapy

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Right heart failure has long been a difficult therapeutic problem. Even more of an enigma has been the small percentage of these cor pulmonale patients whose failure is complicated by the progressive accumulation of carbon dioxide in their system, with eventual narcosis of the central respiratory center.

Carbon dioxide narcosis has been the subject of progressively effective study and treatment since the basic pathologic physiology was defined by Scott in 1920.¹ He demonstrated that in subjects of longstanding hypoxia, particularly due to pulmonary emphysema, the alveolar air and blood show progressive increases in carbon dioxide tension as a result of impaired ventilation. During this process the respiratory center gradually becomes adjusted to higher carbon dioxide levels, thereby losing its sensitivity of response to this principle stimulus to respiration. Other centers, the chemoreceptors of the aortic and carotid bodies, then must assume control of respiration with hypoxia as their only stimulus. The dangerously hypercapnic and acidotic patient depends upon these secondary centers to regulate his respiration.

The extreme cyanosis often suggests the urgent use of oxygen in these patients. Its administration in the hypercapnic, acidotic individual whose respiration is dependent upon hypoxia, results in relieving hypoxia but in doing so depresses respiration to an even more dangerous level. The patient may deteriorate into coma, delirium, mania or may even die. This contradictory response to oxygen therapy is known as the "oxygen paradox," and is a cause of much difficulty in treating this condition. Various approaches have been taken to handle this paradox. Cohn, Carroll and Riley² have detailed the uses of carbon-dioxide-oxygen mixtures, bronchodilators, progressively increasing concentrations of oxygen, carbonic anhydrase inhibitor "6063," pneumoperitoneum, breathing exercises and the Drinker respirator all of which have been advocated.

The prime need of such patients is the elimination of carbon dioxide by hyperventilation to restore sensitivity to their respiratory center. Wilson³ has demonstrated the need for mechanical assistance in patients with severe emphysema since voluntary hyperventilation leads to only slight increase in minute volume. In 1950 Motley⁴ advocated the use of intermittent positive pressure for the treatment of pulmonary emphysema. Boutourline-Young and Whittenberger⁵ later reported success of hyperventilation by the use of the Drinker respirator. Lovejoy⁶ and his associates confirmed the effectiveness of mechanical ventilation by

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the Drinker respirator and Stone⁷ has added further successes to support this rationale of therapy.

The purpose of this report is to present a more convenient application of intermittent positive pressure therapy and its use with compressed air instead of oxygen in the relief of carbon dioxide intoxications.

Case Report

J. M. (B. G. H. A-5401) a 57 year old Italian bellhop was admitted to the Buffalo General Hospital by Dr. Walter Zimdahl, May 28, 1954 with the history of (1) wheezing, productive cough, and intermittent dyspnea for seven years; (2) weakness and persistent shortness of breath for three months and (3) swelling of lower extremities of three weeks duration.

Seven years prior to admission he first suffered episodes of dyspnea associated with wheezing, lasting one to two hours. These were commonly provoked by exertion or upper respiratory tract infections that were not related to any specific insulting agent, although frequently associated with heavy smoking. Copious volumes of thick, white sputum accompanied these attacks. Raising this sputum considerably relieve his respiratory distress.

These attacks increased in frequency and severity until three years prior to admission. Since that time he had little relief. His dyspnea was aggravated by lying down and his ability to work was severely limited. One flight of stairs was his maximum exertional effort. His lips and nail beds became blue. Drowsiness developed into a severe handicap and he frequently fell momentarily asleep while conversing, even when standing.

Three weeks prior to admission, generalized swelling of his lower extremities and abdomen increased his incapacity. Palpitation was marked, particularly after a coughing spell.

Prior to this illness his general health had always been good. There is no history of previous cardiac or respiratory disease; no evidence of asthma. He has a history of urticarial reactions to ingestion of cherries, peaches and prunes. Rather profuse post-nasal and nasal discharge were attributed to sinusitis. He also complained of sharp chest pains during severe attacks of coughing.

He was born in Buffalo, New York and has lived there all his life, residing in one of the industrial areas. He has worked as a bellhop for 18 years. There is no evidence of exposure to concentrations of specific dusts. There have been no operations or injuries.

The functional inquiry revealed the following positive information: lacrimation of the right eye, frequent "colds," frequent epigastric distress with postprandial gaseous eructations. He smokes two packs of cigarettes and drinks three to four "shots" of liquor and several glasses of beer each day. His eating habits are irregular and he drinks up to 30 cups of coffee a day. His father and mother are alive and well at 88 and 78 years, respectively. Five brothers and two sisters are in good health. He has been married 38 years, has three sons and two daughters, all of whom are now in good health. There is no history of any familial disease except for recent pulmonary tuberculosis in one son.

On physical examination his temperature was 100.2° F. (oral), pulse 120, respirations 26 and blood pressure 148 mm. Hg. systolic and 88 mm. Hg. diastolic. He weighed 149 lbs. and was a well developed, well nourished white man who was comfortable, cooperative, and well oriented, but quite drowsy. His mucous membranes were profoundly cyanotic and the general appearance was identified with the text book illustrations of a "black cardiac." The other positive physical findings included complete edentia and marked distension of his neck veins. Expansion of the thoracic cage was bilaterally equal but limited and expiration was prolonged. There was flaring of his costal margins. The percussion note was hyperresonant throughout, somewhat obscuring the area of cardiac dullness. Expiratory wheezes were heard throughout both lung fields, particularly in the supine position. The heart was enlarged with the point of maximal impulse palpable in the sixth interspace at the midclavicular line. The rhythm was regular and sounds were distant. There was a split first mitral sound and a soft systolic murmur was audible at the apex. His abdomen was soft and pendulous with the liver palpable three fingers below the costal margin. No other organ or mass could be felt. The rectal examination was negative. There was marked pitting edema of both legs extending above the knees. Slight clubbing of the nails was present and the nail beds were deeply cyanotic. His neurologic reflexes were in order.

After admission he was confined to bed and treated with aminophyllin, digitalis, aerosol bronchodilators, diuretics, penicillin, chloramphenicol, and low salt diet. At-

tempts to improve his color with oxygen resulted in periods of irrationality and distress, and had to be discontinued. The admission chest roentgenogram was interpreted by Dr. Gordon Culver as follows: "The leaves of the diaphragm are depressed with multiple diaphragmatic impressions produced by emphysematous bullae at the bases. The vascular markings are increased at the hila, probably secondary to the emphysematous changes. The cardiac silhouette is increased in size; the transverse diameter of the chest is 30 cm., of the heart $15\frac{1}{4}$ cm., suggesting cor pulmonale." Admission laboratory data included blood glucose—163 mgm. per cent, blood urea nitrogen—18 mgm. per cent, serum sodium—138 mEq./L., bicarbonate—31.8 mEq./L., chlorides—81.0 mEq./L., and a leucocyte count of 18,000 with 30 bands, 51 filaments, one basophil, eight lymphocytes and 10 monocytes. The erythrocyte count was 5,900,000 with a hematocrit of 63 mm., hemoglobin of 16.2 gm., and sedimentation rate 2 mm./hour. The blood smear was interpreted as macrocytic. The electrocardiogram showed sinus rhythm of 112/min. The P-R interval measured 0.18, and the QRS complex was 0.06. There was right axis deviation with a tall RAVR. Right ventricular activity was preponderant as far as the V6 position. It was interpreted as compatible with the diagnosis of cor pulmonale.

Following a week of therapy for the cardiac status, his weight had been reduced to 136 pounds, a loss of 13 pounds with associated improvement in edema of his extremities but with essentially no change in general condition. Arterial gas analyses were determined at this point with the results as charted in Table I.

TABLE I
J. M.

Re Cardiac Regime Throughout Days	Control		IPPB/I with Comp. Air at 20 cm./H ₂ O							Follow-Up			
	1-7	8-9	10	11	12	13	14	15-16	17	18	49	96	
Weight lbs.	149	136	136	138	133	133	134		133	130	136	134	
Temperature	100 ²²	101 ²⁰	99 ²²	99 ²²	101 ²²	99 ²²	99 ²²		98 ²²	98 ²²			
pCO ₂ mm. Hg. (Normal 40)		63	49	42	47	46	47		42	44	47	38	
O ₂ Per Cent Sat. (Normal 90 <)		63	94	86	92	86	97		96	91	90	92	
pH (Normal 7.4)	7.36		7.38	7.43	7.33	7.35	7.31		7.38	7.39	7.38	7.49	
Hgb (Normal 14.6)	15.5		15.7	17.5	16.9	18.3	15.8		17.2	16.4	16.6	14.0	
Vital Capacity Predicted: 3400 cc.	1680		1957			2039			2018	1978	1590	1764	
Maximum Breathing Capacity Predicted: 93 L/m.	15.7		30.9			36			36	30.6	34.1	31.5	

A summary of the clinical and laboratory findings before, during, and following intermittent positive pressure (IPPB/I) therapy. The arterial blood O₂ and CO₂ content were analyzed immediately according to the method of Van Slyke and Neill. The pCO₂ was determined from the nomogram of Singer and Hastings and pulmonary function studies determined on a Collins spirometer as originally described by Baldwin, Courmand, and Richards. The pH was determined by glass electrode. (Technical assistance by Mr. Daniel Brittain and Mrs. Leida Ajango).

Throughout the remainder of his course there was no change in medication or treatment with the exception of mechanical hyperventilation by intermittent positive pressure (IPPB/I) on the Pulmonary Ventilator.^o (The pressure curve for this machine is illustrated on Figure 1).

For three days he was maintained almost constantly on intermittent positive pressure using compressed air as the motivating power. It was noted during the first 24 hours that he developed periods of apnea lasting 20 to 30 seconds which necessitated constant nursing attention to keep them breathing voluntarily. He was allowed brief periods to rest, eat, go to the bathroom, and have an occasional cigarette. He did

^o Mine Safety Appliances Co., Pittsburgh, Pennsylvania.

not complain of discomfort at any time during the treatment. Results of this procedure on his blood gases can be seen in Table I. It will be noted that hyperventilation decreased the $p\text{CO}_2$ from 63 to 49 mm. Hg. and increased oxygen saturation from 63 per cent to 94 per cent. Pulmonary ventilation was also increased though this may be more a measure of improved ability to perform the test rather than actual organic change. Improvement was maintained spontaneously thereafter.

Clinically, dramatic improvement emerged. He was more alert, breathing increased in depth, frequency and ease of respiration. His color improved. He was more awake during the day, and was able to sleep at night which he had not previously been able to do. He slept while on the intermittent positive pressure machine. On the fourth day, the intermittent positive pressure was decreased to several 10 minute periods each day accompanied by aerosol bronchodilators.

His clinical condition continued to improve to a nearly normal state. His liver was now palpable only one finger below the costal margin and his peripheral edema was no longer evident. He spontaneously volunteered that he had not felt so well for many months. His exercise tolerance progressively increased to the time of discharge on the 19th hospital day. A venesection of 500 cc. of blood, prior to discharge, altered neither his clinical condition nor the blood chemistries significantly.

Following discharge he returned to work where he was able to perform duties as a bellhop without significant discomfort. He stated that although previously unable to carry an ordinary suitcase from the front door to the desk, he was now able to carry a small trunk up one flight of stairs. This improvement has been maintained for over seven months without further pressure therapy but with continuation of his cardiac regime.

Discussion

The use of the Drinker respirator by Boutourline-Young, Whittenberger⁵ and Lovejoy⁶ demonstrated the usefulness of intermittent positive pressure in the treatment of carbon dioxide narcosis. Segal has used the demand valve for short term effects. The use of a demand valve-type respirator has been a considerable improvement over the Drinker respirator for the treatment of this condition. Difficulties in accommodating patients of this type to the Drinker respirator were noted by the original workers. Our patient was relatively comfortable throughout the use of IPPB/I

PULMONARY VENTILATOR

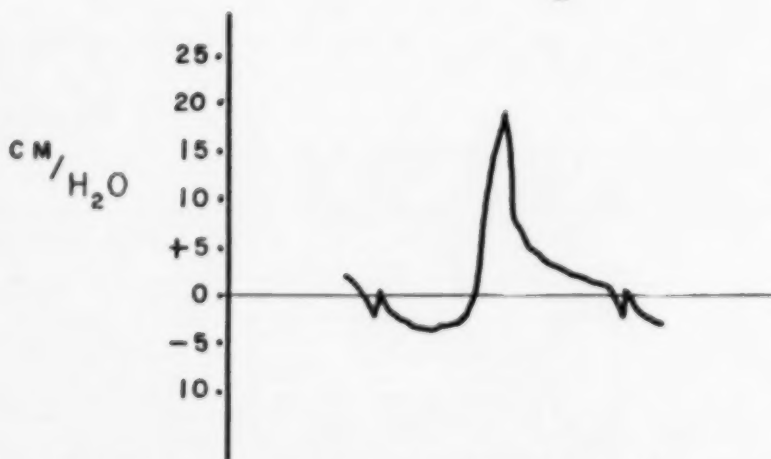


FIGURE 1: The pressure pattern recorded at the mouthpiece of the Pulmonary Ventilator during pressure breathing with this apparatus by a normal individual.

and was essentially self-sufficient. He was able to interrupt his own treatment at will temporarily for eating, talking, bathroom procedures and short periods of rest. Members of his family provided constant nursing attention required to prevent prolonged apnea and to keep him from inadvertently removing the mouthpiece during sleep. His only discomfort was mild irritation of the rubber mouthpiece on edentulous gums. Toward the end of treatment he accommodated completely enough to allow long periods of sleep while on the Ventilator.

The use of compressed air for activation of the IPPB/I avoided the difficulties frequently encountered with oxygen in this type patient. The "oxygen paradox" was not a concern though he went through short periods of apnea during the hyperventilation process. While this was not a serious concern to this patient, in other cases in which this method has been used the degree of apnea has been greater. Manual operation of the demand valve nicely accommodates for that situation and maintains respiration in spite of loss of inherent stimulus to respiration on the part of the patient. This, however, necessitates constant attendance to the patient during the early days of hyperventilation. An air piston actuator is being developed to make this process automatic when the patient becomes apneic.

It is to be emphasized that the ultimate effect of this treatment is entirely dependent upon the underlying cardio-pulmonary pathology. In the case presented, the cardio-pulmonary status was adequate to provide good function once the respiratory center was sufficiently refreshed to allow spontaneous hyperventilation by the patient. In another similar case the rejuvenation of the respiratory center was accomplished quite successfully, so much so, that overexertion following convalescence produced irreversible cardiac decompensation and death. In another case where the arterial carbon dioxide level was equally high but without actual narcosis, hyperventilation effected no reduction of the hypercapnia though anoxia was temporarily relieved. There was no permanent clinical improvement. It would seem, therefore, that the determining factor is not the level of carbon dioxide or oxygen but rather the efficacy of the cardio-pulmonary system to maintain that level within physiologic ranges. This can be improved by maintenance medications.

The most stimulating aspect of this case has been a consideration of possible explanations of the rather dramatic and prolonged success of hyperventilation. The relative influence of the mechanical ventilator, infection, spontaneous hyperventilation and the relationship of carbon dioxide blood tension to pulmonary artery pressure are all worthy of attention.

Prior to IPPB/I therapy this man was incapacitated in spite of adequate cardiac treatment. Following therapy his capacity for activity is markedly increased and maintained on essentially the same cardiac regime. It is difficult to believe that the pressure per se has accomplished this. Ventilation studies on a group of emphysema patients in our own laboratory before and after IPPB/I alone have demonstrated no such dramatic effects.

The relationship of infection to this whole problem is difficult to assay. Some individuals would choose to believe that clearing of the infectious process which, after all, was the final decompensating factor, is the mechanism of his improvement. While this undoubtedly influenced his progress, it is difficult to accept that successful therapy of inflammation of such proportion that it is almost non-existent roentgenologically, could determine the profound alteration in his cardio-pulmonary physiology.

Increased hyperventilation as a result of the reactivated respiratory center undoubtedly affects improvement. However, Wilson et al,³ have shown that emphysematous patients, in contrast to other anoxic states, are unable to effectively alter their work capacity by voluntary hyperventilation. On this basis, one can not ascribe this improvement entirely to hyperventilation. Another possible explanation is that some alteration is accomplished in the cardiac compensation by correction of the hypercapnic state. A lead in this direction is suggested by the studies of Cade and Miller⁶ that IPPB/I alone is of no benefit in chronic pulmonary disease except in cor pulmonale. A singular effect was noted in this group suggesting that there is some influence on the cardiac status.

Experimental studies of Whitaker⁸ suggest a possible contributing factor to this singular effect. He studied the pulmonary artery blood pressure by cardiac catheterization in patients with chronic pulmonary disease with, recovering from, and without congestive failure. Simultaneous observations were made on the pulmonary artery pressure, the blood oxygen and carbon dioxide content, the hematocrit value, and oxygen consumption. Patients without heart failure had pulmonary artery mean blood pressures which ranged from normal to twice normal, while those with heart failure had pressures consistently higher than this. Recovery from heart failure was accompanied by a fall of pulmonary artery blood pressure to the same range recorded in patients without failure. This observation suggested that heart failure was not caused by irreversible pulmonary hypertension, as has been frequently postulated in heart failure associated with chronic pulmonary disease.

Arterial and mixed venous anoxia was present in all patients with congestive failure in Whitaker's series, and recovery from failure was accompanied by increase of blood oxygen saturation. However, oxygen breathing in patients with congestive heart failure did not reduce the pulmonary artery blood pressure to recovery levels even though higher degrees of oxygen-saturation were achieved. Hence, Whitaker concluded pulmonary hypertension of congestive heart failure does not appear to be due solely to a pulmonary vasoconstriction produced directly by anoxia.

Carbon dioxide retention appears to be significantly related to the pulmonary hypertension of right heart failure, since it occurred in patients with heart failure and, since experimental work in animals¹⁰ has shown that such retention causes pulmonary hypertension. In 21 observations Whitaker found that the correlation coefficient between elevated pulmonary artery mean blood pressure and the increased carbon dioxide content of the mixed venous blood was 0.94. In cases of chronic pulmonary heart

disease which have been notoriously refractory to oxygen therapy, it is possible that a pulmonary vasoconstrictor effect due to the retention of carbon dioxide has been equal or greater than any dilator effect from the relief of anoxia.

Lovejoy has suggested this and has demonstrated it clinically in at least one patient. Hemodynamic studies prior to mechanical hyperventilation in a patient with carbon dioxide narcosis, revealed a mean pulmonary artery pressure of 60 mm. of mercury. Two and one-half months following clinical relief of carbon dioxide narcosis, the mean pulmonary artery pressure had fallen to 29 mm. of mercury with a decline in the partial pressure of the arterial carbon dioxide from 77 to 48 mm. of mercury, and an associated rise in oxygen saturation from 50.5 to 86.7 per cent.

In the cases such as reported by Lovejoy and in this paper, where the response to hyperventilation of carbon dioxide has been greater than anticipated, it is possible the correction of hypercapnia has lowered the pulmonary artery pressure sufficiently to allow compensation of the failing right ventricle. The combined effect of restoration of sensitivity to the respiratory center, plus this added compensation of the circulatory system may account for much of the continued improvement in our patient. In addition, recurrence of the hypercapnia is prevented by the sensitive respiratory center, which, in turn, avoids the pulmonary hypertension which previously induced cardiac failure. A balance then in both the respiratory and circulatory systems will allow a greater work tolerance. Hyperventilation in patients with carbon dioxide narcosis could conceivably produce both of these effects and afford considerable increase in activity to the patient, as was demonstrated in our case. Further catheterization studies similar to those of Whitaker and Lovejoy will be necessary in patients of this type to substantiate these concepts.

SUMMARY

The history of a patient is presented in which severe carbon dioxide narcosis and right heart failure resulted from long standing pulmonary emphysema. The usual cardiac regime was ineffective and relief was obtained by the use of simple intermittent positive pressure therapy on compressed air. It is suggested that pulmonary hypertension from the hypercapnia may be the controlling factor in patients of this type.

RESUMEN

Se presenta la historia de un enfermo en el que ocurrió narcosis severa causada por el bióxido de carbono e insuficiencia cardíaca derecha como resultado de enfisema pulmonar de larga duración.

El régimen cardíaco habitual fué ineficaz y el alivio se obtuvo por el uso simple de presión positiva intermitente con aire comprimido. Se sugiere que la hipertensión pulmonar por hipercapnia puede ser el factor dominante en enfermos de este tipo.

RESUME

L'auteur rapporte un cas dans lequel une sévère perte de connaissance, avec insuffisance du coeur droit due à l'acide carbonique provenait d'un

emphysème pulmonaire déjà ancien. La thérapeutique cardiaque habituelle fut inefficace et le soulagement ne fut obtenu que par respiration d'air comprimé sous pression positive intermittente.

L'auteur émet l'hypothèse que l'hypertension pulmonaire due à l'hypercapnie pourrait être le facteur décisif chez les malades de ce type.

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Viral Diseases of the Chest

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In preparing this review I have deliberately avoided a detailed discussion of the diagnosis and treatment of those diseases for which the etiology, diagnosis and treatment are reasonably well understood, but rather I shall try to outline the present "strategic situation" regarding that vast group of infections especially of the lower respiratory tract about which our knowledge has been fragmentary and incomplete. For those who may be interested in a more systematic review and also for use as a reference for the aspects selected for discussion, the various viral and rickettsial agents known to affect the chest together with those whose relation to thoracic disease is less well established are briefly summarized in Table I.

The members of the American College of Chest Physicians have a reputation for taking a strongly positive attitude toward the management of disease problems and I hope that they will not regard this presentation as too negative.

By far the most common group of infections confronting the chest physician are the diseases of the respiratory tract. In Table I, the common cold, exudative pharyngitis (E.P.) and other conditions primarily limited to the upper respiratory tract are included because of the fact that these milder diseases of the upper respiratory tract play a prominent role in predisposing to more serious secondary infection of the lungs. The great frequency of respiratory infection in our population has been emphasized by the study of Dingle and his associates at Western Reserve University. They are following a group of families there day in and day out and recording the incidence and character so far as it can be determined of

TABLE II
ILLNESS IN CLEVELAND FAMILIES
Incidence of Major Classes of Illness, 1948-1950

Class of Illness	Number of Illnesses			Illnesses Per Person-Year		
	1948	1949	1950	1948	1949	1950
Total Illnesses	1,626	2,500	2,553	9.7	9.9	10.0
Common Respiratory Diseases	1,055	1,582	1,563	6.3	6.3	6.1
Specific Respiratory Diseases	63	60	105	.4	.2	.4
"Other" Infections	70	180	166	.4	.7	.7
Gastrointestinal Illnesses	258	423	404	1.5	1.7	1.0
Constitutional Illnesses	28	46	49	.2	.2	.2
Other Illnesses	152	209	266	.9	.8	1.0

From Dingle, J. H., *et al.*, Amer. Jour. Hyg., 58:16-31, 1953.

*Division of Virology, Department of Infectious Diseases, University of California Medical Center.

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**SUMMARY CHART OF VIRAL AND RICKETTSIAL DISEASES
OF THE CHEST**

Disease	Etiologic Agent	Specific Treatment	Prophylactic Treatment	Laboratory Diagnosis
A. Primary diseases of the respiratory tract.				
1. Common cold ¹⁰	Poorly characterized virus—satisfactory experimental system not yet available	None	None	None
2. Undifferentiated Acute Respiratory Disease (ARD) ⁸	Substantial proportion of 2, 3, and 4 probably and related agents ⁸ cultivated in tissue culture	None (?)	None	Tissue culture neutralization tests for antibodies, in sera ⁸ recovery of virus in HeLa cell cultures
3. Exudative Pharyngitis (E. P.) ⁸		None (?)	None	
4. Primary Atypical Pneumonia (PAP), Cold Agglutinin MG Negative type ¹		None (?)	None	
5. PAP, Cold Agglutinin and Streptococcus MG positive type ¹	Virus transmissible only to man	None (?)	None	Cold agglutinins and streptococcus MG agglutinins in sera
6. Q Fever ⁷	<i>Coxiella burneti</i> , Small rickettsia acquired from cattle, sheep, and goats. Transmissible to eggs hamsters and guinea pigs	Broad Spectrum Antibiotics	None	Complement fixation tests for antibodies in sera. Recovery of rickettsia in eggs, hamsters or guinea pigs
7. Influenza A, B, and C ⁹	Viruses of influenza A, B, and C. Hemagglutinating viruses transmissible to eggs, ferrets and mice	None	Killed virus vaccine (for A, and B)	Complement fixation and virus neutralization tests for antibodies in sera. Recovery of virus in eggs, ferrets or mice
8. Psittacosis-Ornithosis ²	Large "basophilic" viruses—acquired from birds. Transmissible to embryonated eggs and mice	Broad Spectrum Antibiotics	None	Complement-fixation tests for antibodies in sera. Recovery of virus
9. Lymphocytic choriomeningitis ¹⁰	Virus of LCM—acquired from mice and other animals. Transmissible to mice and guinea pigs	None	None	Complement-fixation and neutralization tests for antibodies. Recovery of virus
10. Cytoplasmic inclusion pneumonia of infants ¹¹	Presumptive evidence that this disease is caused by a strain of distemper virus	None	?	Egg neutralization tests for antibodies in sera
B. Infections primarily characterized by manifestations in other organ systems but also affecting the respiratory tract.				
1. Measles ¹²	Virus of measles transmissible to monkeys, embryonated eggs, and tissue cultures	None	Gamma Globulin	None

SUMMARY CHART OF VIRAL AND RICKETTSIAL DISEASES OF THE CHEST

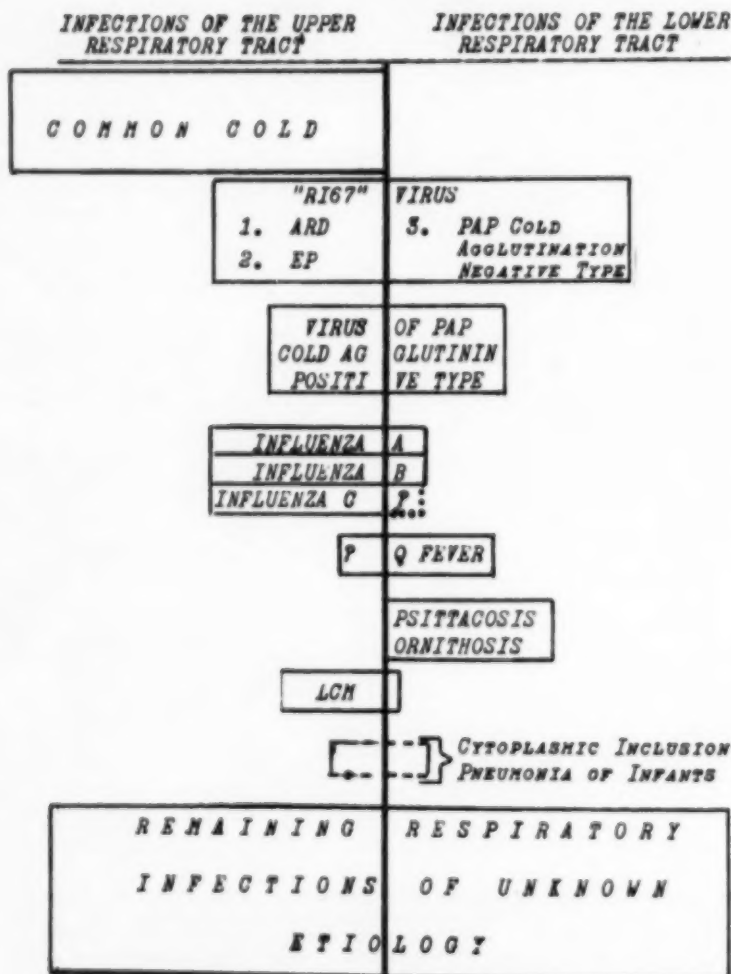
Disease	Etiologic Agent	Specific Treatment	Prophylactic Treatment	Laboratory Diagnosis
2. Variola ¹²	Large virus transmissible to embryonated eggs	None	Living virus vaccine	Direct identification of virus by microscopy and complement-fixation. Isolation of virus in eggs. Complement-fixation and hemagglutination inhibition tests for antibodies in sera
3. Rocky Mountain Spotted Fever ¹³	<i>Rickettsia rickettsii</i> transmissible to eggs and guinea pigs	Broad Spectrum Antibiotics	Killed rickettsial vaccine	Complement-fixation and Weil-Felix agglutination tests for antibodies in sera isolation of rickettsia in eggs and guinea pigs
4. Typhus ¹⁴	<i>Rickettsia mooseri</i> and <i>R. prowazeki</i> transmissible to eggs and guinea pigs	Broad Spectrum Antibiotics	Killed rickettsial vaccine	Complement-fixation and Weil-Felix agglutination tests for antibodies in sera isolation of rickettsia in eggs and guinea pigs
5. Infectious Mononucleosis ¹⁵	Viral etiology suspected but not proved	None	None	Tests for heterophile antibodies in sera
C. Miscellaneous infections affecting chest.				
1. Epidemic pleurodynia, ¹⁶ (Bornholm disease)	Viruses of Coxsackie B group transmissible to suckling mice	None	None	Virus isolation in suckling mice complement-fixation and neutralization tests for antibodies in sera (usefulness of serological tests limited by large number of antigenically different viruses)
2. Mumps (thyroiditis, presternal edema) ¹⁷	Virus of mumps, hemagglutinating virus transmissible to eggs, baby hamsters, ¹⁸ and monkeys	None	Killed virus vaccine	Complement-fixation and neutralization tests for antibodies in sera. Virus isolation in eggs or suckling hamsters

*All serological tests depend on the demonstration of an increase in antibodies during the course of a particular illness and require a serum collected early in the acute phase of the disease for comparison with sera collected during convalescence and recovery. Occasionally a high level of complement fixing antibody in a single specimen permits a presumptive laboratory diagnosis.

every disease in each subject. A review of their results at the end of three years, Table II, shows that respiratory disease is by far the most frequent in this population group and that the definitive infection, i.e., those caused by known infectious agents, comprise a small proportion of the total disease.

With the discovery of each new agent causing respiratory disease, the psittacosis ornithosis group, the influenza viruses, the rickettsia of Q fever and the perennial rediscovery of the common-cold virus, we have hoped that we could account for the etiology for a greater proportion of

RELATIVE ROLES OF VIRAL AND RICKETTSIAL
AGENTS IN PRIMARY RESPIRATORY INFECTIONS



these diseases. It is true that in epidemics of influenza A, or Q fever and so on that it has been possible to establish a specific etiologic diagnosis in a majority of cases. In day in-and day out endemic disease, however, this has not been true. In Fig. 1, the approximate relative incidence of infections with the known and unknown agents is shown. The one significant encouraging development in this field is the discovery of the "RI67" virus by Hilleman and Werner,⁴ and the demonstration that this agent is a major cause of respiratory disease. The space given to RI67 in Figure 1 is quite hypothetical, based on the incomplete studies of Hilleman and of Rowe, et al.,⁵ much of which is still unpublished. At least we can say that virus RI67 can be propagated in Cleveland as well as in Washington. Further, it reacts with a high proportion of sera collected over the years from patients with acute respiratory disease, ARD, E.P., and primary atypical pneumonia of the cold agglutinin positive type as well as with the sera from patients in the Fort Leonard Wood epidemic in which RI67 virus was originally recovered. We can hardly expect a single agent, or family of agents, as RI67 may turn out to be, to account for all of the disease of unknown etiology but it is reasonable to expect that RI67 and related viruses may account for a substantial proportion.

It is appropriate at this time to emphasize the tremendous importance of the revival of the use of tissue cultures for virus work stemming from the work of Enders and his associates.¹⁷ Agent RI67 was originally isolated in cultures of human tracheal epithelium⁴ but is now propagated in the HeLa cell, a strain of cells derived from a carcinoma of the cervix and developed for the propagation of virus as by Scherer, Syverton, and Gey.¹⁸ Further application of these methods should result in even more substantial developments in our knowledge of the etiology of disease.

The second major recent achievement in the field of viral disease of the thoracic area is the discovery that viruses of the Coxsackie B group are responsible for epidemic pleurodynia or Bornholm disease.¹⁵ Again the characterization of the Coxsackie viruses rests on a new technique, the use of suckling mice for transmission in the laboratory. In suckling mice, or in adult mice treated with large doses of cortisone, the Coxsackie B viruses are pantropic, i.e., they cause destructive lesions, usually resulting in death, of almost all organs and tissues; skeletal muscle, pancreas and liver are particularly vulnerable. The disease in the human subject is self limited and deaths have not been reported. The lesions actually responsible for the severe pain in the pleurodynia have not been described.

SUMMARY

Newer techniques promise to give us a better understanding of the etiology of infectious diseases of the chest and with such knowledge, developments in prevention and therapy can be anticipated.

RESUMEN

Las técnicas más nuevas prometen darnos una mejor comprensión de la etiología de las enfermedades infecciosas del tórax y con tal conocimiento pueden esperarse progresos en la prevención y terapéutica.

RESUME

Des procédés techniques plus nouveaux promettent de nous mieux éclairer sur l'étiologie des maladies infectieuses du thorax. Grâce à une telle connaissance, on peut prévoir les développements de la prophylaxie et de la thérapeutique.

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Irradiation Therapy in Hodgkin's Disease of the Thorax*

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There is considerable medical literature concerning the subject of Hodgkin's disease, including studies on etiology, pathology, clinical picture and therapy. Most of these studies consider the entire group of patients with Hodgkin's disease, but from time to time there are published investigations in the diagnosis or treatment of Hodgkin's disease as it affects an organ system or a certain region of the body. As part of an overall review of patients with Hodgkin's disease receiving irradiation therapy, we thought it would be of interest to make a special study of those cases involving the thorax.

Incidence of Thoracic Involvement

One or more thoracic structures are involved in a high percentage of patients at some time during the course of the disease. Vieta and Craver¹¹ found that 74 per cent of 335 patients studied clinically had roentgenographic evidence of thoracic involvement. In a series of 51 post mortem observations they found 88 per cent revealed thoracic disease. They urged more frequent roentgen examination in following these patients.

In our series of 224 proved cases of Hodgkin's disease, the apparent site of initial involvement was in the mediastinal lymph nodes in 12, and consisted of mediastinal lymphadenopathy plus pulmonary infiltration in three more patients. Seventeen had involvement of mediastinal and cervical nodes when first seen and in some it might be difficult to be sure of the site of onset. However, in 32 (14.3 per cent) the disease apparently started in the mediastinal area or in the nearby cervical area.

At some time during the course of the disease, 106 (47 per cent) more patients developed thoracic involvement which was detected by roentgenographic examination. In six others some thoracic involvement was found at autopsy. Since only 28 (12.5 per cent) of this series have had post mortem examination at this hospital, it is quite likely that a large series of post mortem examinations would show more instances of thoracic involvement. Thus, while we demonstrated 64 per cent (144 patients) had thoracic involvement, it was present in all 28 in the post mortem series.

In 224 patients the incidence of detected involvement of the intrathoracic structures were as shown in Table I.

TABLE I

	Patients	Percentage
Mediastinal lymph nodes	134	60.0
Pulmonary parenchyma	65	22.0
Pleural effusion	24	10.7
Pericardial effusion	3	1.3
Heart	1	0.5

*From the Department of Radiology, University of Minnesota Medical School.

In addition, if one considers the thorax as a whole, there were 16 patients with involvement of the thoracic spine, six with lesions in the breast, and four involving the chest wall. One of the latter had a diagnosis of mycosis fungoides as the initial finding of the disease.

Roentgen Diagnostic Findings

The roentgen findings in Hodgkin's disease of the thorax have been reviewed extensively by Kirklin and Hefke⁶ and later by Vieta and Craver.¹¹ Those authors cite extensive bibliographies covering various roentgen features. The most frequent intrathoracic manifestation consists of the presence of a mediastinal mass which consists of groups of enlarged lymph nodes matted together. At times, a rather discrete lymph nodal mass may be present. Infiltrate and nodules of soft tissue density may be seen in the pulmonary parenchyma. Although unusual, cavitation may be observed in a parenchymal mass and, rarely, miliary pulmonary densities exist. There may be pleural thickening or effusion, with or without the presence of pleural granulomatous lesions. Pleural fluid on aspiration may be serosanguinous, serofibrinous or chylous. In addition to cavitation, fistulous tracts may be formed, resulting in broncho-pleural, tracheo-bronchial or tracheo-esophageal communications. Mucosal plaques may form in the tracheo-bronchial tree in Hodgkin's disease. Other lymphomas, such as lymphosarcoma, show most of these findings, but pulmonary cavities, bronchial plaques and fistulae are seldom encountered.¹¹

Therapy in Hodgkin's Disease

The approach to therapy in Hodgkin's is of necessity dependent upon concepts of pathology, pathogenesis and natural history of the disease. Jackson and Parker^{4,5} relate prognosis to histologic sub-groups designated as Hodgkin's paraganuloma, Hodgkin's granuloma and Hodgkin's sarcoma, the last being most malignant. To those who believe in the multifocal origin of Hodgkin's disease this might seem a logical way of explaining differences in survival of various patients.

Among others, Lenz et al.⁷ and Peters⁹ believe that at least some of the patients have a unifocal origin of disease. The latter lists a clinical staging of patients with Hodgkin's disease as follows:

- I. Involvement of a single lymph node region or a single lesion elsewhere in the body.
- II. Involvement of two or more proximal lymph node regions of either the upper or lower trunk.
- III. Involvement of two or more lymph node regions of both the upper and lower trunk.

Peters found a considerable degree of correlation between prognosis and histopathologic picture but observed a better degree of correlation between prognosis and clinical staging.

For over 20 years it has been the policy of the Radiation Therapy Department of the University of Minnesota Hospitals to regard at least some patients as having unifocal origin of disease with the result that

those first seen with apparently localized disease have received intensive roentgen therapy, attempting to eradicate the disease. Those with multiple foci of disease when first seen have received palliative irradiation, i.e., lower dosage has been used, in an attempt to reduce size of tumor masses and improve the general clinical status.

It is to be emphasized that treatment should be individualized. The radiotherapist must be cognizant of the day-to-day general clinical condition of the patient. A basic principle in planning therapy for a patient is to utilize an optimum dosage of irradiation within certain time limits. In general, when the disease is localized to one or a few adjacent regions, an attempt is made to deliver a minimum of 2,000 tissue roentgens to the tumor in 14 days. At present the factors include: 250 kv.p., 30 mm. Cu. h.v.l., and 70 cm. distance. Relatively large masses of long standing may require heavier dosage, but even in the smaller masses, a minimum dose of 2,000 tissue roentgens is desirable.

Complete chains of nodes are included in the fields during therapy. For example, submaxillary, cervical and supraclavicular chains are irradiated if any node in these areas is involved. For mediastinal nodes the field should project at least 5 cm. or more above and below the roentgenologically demonstrated extent of disease. So-called prophylactic irradiation to other nodal areas is not given so that adequate dosage may be tolerated in areas where disease appears.

When there is massive involvement of mediastinal nodes, small doses of 50 to 75 r in air are used initially to obviate possible edematous compression of the tracheo-bronchial tree. A total dose of 2,000 tissue roentgens is still given within a period of three weeks.

In those with widespread disease involvement a tissue dose of 1,000 to 1,500 roentgens is given to the larger tumor masses in an attempt to improve the general condition of the patient. Although it is problematic as to how much survival is prolonged, definite palliation of clinical symptoms is obtained in most cases, so that the patient is relatively more comfortable. Nitrogen mustards and TEM may be used as valuable adjuncts in these patients.

Spinal cord compression is occasionally encountered. If symptoms of paresis develop, decompressive laminectomy should be performed without delay, followed immediately by roentgen therapy. The remarkable palliation which may be obtained is emphasized by Smith and Stenstrom.¹⁰

Results of Therapy

In our total series of 224 patients with Hodgkin's disease previously reported⁸ there were 208 who were followed five years or longer. Of these, 52 (25 per cent) survived five years or longer. There were 167 who had been followed 10 years or longer, and of these, 19 (11 per cent) had survived 10 years.

From a survey of the medical literature it was found that these figures are as good or better than most comparable series of like size. However, in Peters⁹ series of 113 patients, the five-year survival was 51 per cent,

which is by far the highest recorded to this date. Almost all reported series show an improvement in treated as compared to untreated cases. Ewing³ gave an average survival of 18 months for untreated patients, and Craft¹ found that 6 per cent of 52 untreated patients survived five years. No untreated case had survived 10 years.

With due charity toward other series reported in the literature, Peters stated that various series would be more comparable if the number of patients in the three clinical stages were cited for comparison. She noted an 88 per cent five-year survival in 35 stage I cases, 72 per cent in 32 stage II cases, and 9 per cent in 46 stage III cases. For those followed 10 years or longer, she reported a 79 per cent 10-year survival in 19 stage I cases, 21 per cent in 19 stage II cases, and none of the stage III cases survived 10 years.

When we attempt to place our patients in clinical stages we found a large number were in stage III. However, we did find an 85 per cent five-year survival in 20 stage I cases, 90 per cent in 20 stage II cases, and 10 per cent in 168 stage III cases. For those patients followed 10 years or longer we found a 77 per cent 10-year survival in 13 stage I cases, 35 per cent in 17 stage II cases and 2 per cent in 143 stage III cases.

In our series of 131 patients who had been treated for some form of thoracic involvement with Hodgkin's disease, 124 were treated five or more years before this analysis. Of these, 35 (28 per cent) survived five years after the first roentgen treatment and 30 (24 per cent) survived five years after the first thoracic roentgen treatment. Of 105 patients available for 10-year survival analysis, 12 (11 per cent) survived 10 years after the first roentgen treatment, and 10 (10 per cent) survived 10 years after the first thoracic roentgen treatment.

We thought it would be of further interest to divide our patients with thoracic involvement into three clinical stages, as described above. There were eight in stage I, 17 in stage II and 106 in stage III. Of the eight in stage I, seven (88 per cent) survived five years after the first roentgen treatment, and six (75 per cent) survived five years after the first thoracic roentgen treatment. Of the 17 in stage II, 100 per cent, survived five years after the first roentgen treatment, and 15 (81 per cent) survived five years after the first thoracic roentgen treatment. Of the 99 in stage III, 11 (11 per cent) survived five years after the first roentgen treatment, and nine (9 per cent) survived five years after the first thoracic roentgen treatment.

In the 10-year analysis, of seven patients in stage I, six (86 per cent) survived 10 years after the first roentgen treatment and five (70 per cent) survived 10 years after the first thoracic roentgen treatment. Of 13 patients in stage II, four (21 per cent) survived 10 years after the first roentgen treatment, and three (23 per cent) survived 10 years after the first thoracic roentgen treatment. Thus, although there is little significant difference in five-year survival rates for stages I and II, there appears to be a definite difference in the 10-year survival rates. Of 85 stage III patients available for 10-year analysis, only two slightly (2 per cent) sur-

vived 10 years after the first roentgen treatment, and the same two survived 10 years after the first thoracic roentgen treatment. These results are tabulated in Tables II and III.

TABLE II
SURVIVAL AFTER FIRST ROENTGEN TREATMENT

Five-Year Survival			Ten-Year Survival		
Stage	No. of Cases	Survivals No. Per Cent	No. of Cases	Survivals No. Per Cent	
I	8	7 88	7	6 86	
II	17	17 100	13	4 31	
III	99	11 11	85	2 2	
Totals	124	35 28	105	12 11	

TABLE III
SURVIVAL AFTER FIRST THORACIC ROENTGEN TREATMENT

Five-Year Survival			Ten-Year Survival		
Stage	No. of Cases	Survivals No. Per Cent	No. of Cases	Survivals No. Per Cent	
I	8	6 75	7	5 70	
II	17	15 81	13	3 23	
III	99	9 9	85	2 2	
Totals	124	30 24	105	10 10	

It should be added that histologic sections in all of these cases were reviewed by Dr. Robert Hebbel of the Department of Pathology. He confirmed the diagnosis of Hodgkin's disease in all but stated he was unable to make clear distinction of sub-groups such as Hodgkin's paraganuloma, granuloma and sarcoma.

Discussion

While the total five-year survival figures of 23 per cent after the first thoracic roentgen treatment leaves much to be desired, the fact that 21 (84 per cent) of the 25 in stages I and II survived five years after the first thoracic treatment seems significant. When a patient is first seen with involvement of the mediastinal nodes only, or of the mediastinal nodes and cervical nodes on one side only, it seems justifiable to treat the disease intensively, i.e., with the view of attempting to eradicate it. In our opinion, it is not sufficient to give a dosage that will decrease the size of the tumoral mass or masses; rather it seems advisable to give at least 2,000 tissue roentgens in two weeks as a minimum dosage. When large mediastinal masses dictate caution in the first few treatments, an attempt should be made to give 2,000 tissue roentgens or more within three weeks.

Occasionally, an untreated mass will be seen to decrease in size while another area is being treated. Thus, if one is treating a cervical mass, the size of enlarged mediastinal nodes may temporarily decrease. This should not lead one into a sense of false security and, if after thorough examination, a patient appears to have disease limited to the mediastinal nodes and one cervical area, both of these areas should be treated concomitantly as well as intensively.



FIGURE 1A

FIGURE 1B

FIGURE 1C

Figure 1A: September 18, 1943. Large mass in mediastinum, with concomitant enlargement of left cervical nodes (clinical stage II).—*Figure 1B:* October 25, 1943. Re-examination near end of initial roentgen therapeutic series. This patient received doses of 1500 r/air to anterior and posterior cervical fields, 1200 r/air to a lateral left cervical field, and 1800 r/air into anterior and posterior mediastinal fields between the dates of October 5 and 28, 1943. In such a patient, the initial two or three doses to the mediastinum are in the range of 50-75 r/air, and an attempt is made to deliver the basic minimum of 2,000 tissue roentgens in three weeks instead of two weeks. The cervical region is treated concomitantly, and doses of 300 r/air are used in the beginning.—*Figure 1C:* February 7, 1944. Re-examination four months after initiation of therapy shows a good therapeutic response.—*Figure 1D:* June 15, 1944. Re-examination is noted without any further treatment beyond the initial series.—*Figure 1E:* April 29, 1944. Ten and one-half years following the initial roentgen therapeutic series the chest roentgenogram reveals no evident disease.

One should not be dismayed by the size of the tumoral mass as long as the patient appears to have relatively localized disease. That long survival may follow intensive treatment is well illustrated by the series of roentgenograms shown in Figure I.

There have been relatively few reported series on therapy of Hodgkin's disease as it involves the thorax. Wright¹² reported a series of 60 patients treated by x-ray, of which 44 were followed to time of death. Of these, 23 lived over 40 months, with an average survival of 60 months. Of 21 who lived less than 40 months, the average survival was 20 months. Of 13 living at the time of the report, the average survival was 50 months. Seven had lived more than 72 months.

Desjardins² described a method of treating Hodgkin's disease and lymphosarcoma of the thorax. He advised using 130-140 kv.p. with 6 mm. Al filter, giving 550 r to each of two anterior and two posterior fields in one or two days. Another method he described utilized 200 kv.p. with 600 r to each field in three to six days. The treatment was repeated in three weeks. No statistics on survival were given.

It would seem, when one studies the various series of Hodgkin's disease in general, and specifically for purpose of this discussion, the series of Wright and the present series, that the natural history of the disease varies in various patients. One might surmise that even if patients were not treated, those in stages I and II would have a better outlook than those in stage III. However, from the series of untreated cases which have been reported, it seems logical to conclude that intensive therapy prolongs life in patients of stages I and II. While it is problematic just how much treatment may prolong life in patients of stage III, a definite palliation, as evidenced by reduced size of treated masses and improved general well-being, is obtained by judicious therapy.

SUMMARY AND CONCLUSIONS

The clinical staging of patients with Hodgkin's disease in general, as well as in those with thoracic Hodgkin's disease, seems to be the best factor to evaluate in outlining therapy and seems to be the factor best correlated with prognosis.

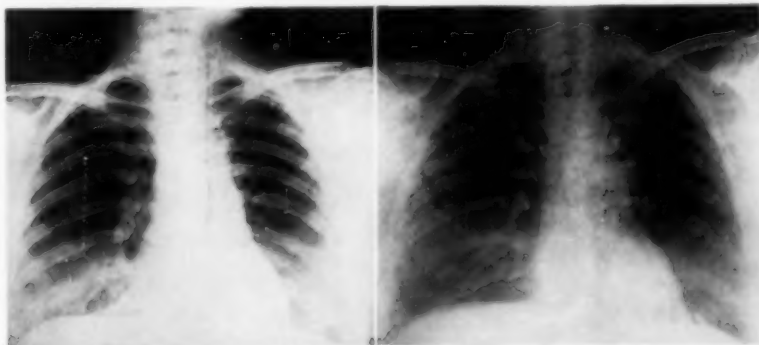


FIGURE 1D

FIGURE 1E

Intensive roentgen therapy, with an attempt to deliver a dosage of at least 2,000 roentgens in two weeks, is indicated in patients of stages I and II. In those with stage III disease, palliative roentgen therapy and clinical agents, such as nitrogen mustards and TEM, may give much symptomatic relief.

RESUMEN Y CONCLUSIONES

El mejor factor por valorizar al planear el tratamiento de la enfermedad de Hodgkin sea general o torácica parece ser la determinación de los grados clínicos y parece además, el factor mejor correlacionado con el pronóstico.

En los enfermos en el estado I y II la roentgenterapia intensa intentando dar una dosis de por lo menos 2,000 r. en dos semanas, está indicada. En los que se encuentran en el estado III la roentgenterapia paliativa y los agentes clínicos tales como la mostaza nitrogenada y el TEM pueden producir mejoría sintomática.

RESUME

Autant chez les malades atteints de maladie de Hodgkin généralisée, que chez ceux atteints de maladie de Hodgkin thoracique, l'évolution clinique semble être le meilleur facteur sur lequel on puisse baser la conduite thérapeutique. Il semble que ce soit l'élément dont dépende le plus étroitement le pronostic.

La radiothérapie intensive, en essayant de faire supporter une dose d'au moins 2,000 R en deux semaines est indiquée chez les malades au stade I et II. Pour ceux du stade III, une radiothérapie palliative et des agents cliniques tels que le gaz-moutarde, et le T.E.M. peuvent apporter une grande amélioration symptomatique.

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Conventional Therapy Versus the Continuous and Concurrent Use of Streptomycin, Isoniazid, and Para-aminosalicylic Acid Plus Early Surgery in the Treatment of Tuberculosis

Two Year Report

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Even with present antibiotics and surgical technics, three characteristics of tuberculosis remain which make successful treatment difficult. First is the tendency of tubercle bacilli to become resistant to any known antibiotic when they can continue to multiply in the presence of small quantities of the drug;¹⁰ since it has been shown that the use of antibiotics in combination delays the emergence of resistant strains of organisms,^{1, 6, 8, 12, 13, 14} we have used, for two full years, a combination of the three best known and most potent antituberculous drugs—streptomycin, para-aminosalicylic acid and isoniazid continuously and concurrently. The second characteristic is the tendency of the blood vessels in the diseased area to become obliterated.² This in turn further decreases the concentration of antibiotics where they are most needed; those areas to which the blood supply is poor or absent are resected and no collapse procedures, which further decrease blood supply⁷ have been done for over two years. The third characteristic is the extensive bronchitis with resultant bronchial stenosis and bronchiectasis;^{4, 11} bronchitis responds to chemotherapy but bronchial stenosis and bronchiectasis require resection. This report is a comparison study between Group I, 110 patients already in our hospital on May 31, 1952 who received conventional therapy and Group II, 101 patients admitted between June 1, 1952 and June 1, 1953 who received streptomycin, para-aminosalicylic acid and isoniazid continuously and concurrently plus early resectional surgery. The status of all of these patients is given as of June 1, 1954.

Material and Methods

The 110 patients in Group I received para-aminosalicylic acid on admission and streptomycin gms. 1 twice a week in courses, along with rigid bed rest, collapse therapy, predominantly pneumoperitoneum, and resectional surgery as indicated. Resistance studies were done only when the patient did not become negative at the end of six months or more. After July 17, 1952, those who wished to take isonicotinic acid hydrazid were given the drug and it was continued until discharge; but all three drugs were not given concurrently and continuously.

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The 101 patients in Group II received 1 gm. of streptomycin sulfate intramuscularly twice a week, children under 12 years of age received $\frac{1}{2}$ gm. intramuscularly twice a week. Isonicotinic acid hydrazid was administered daily to all age groups on the basis of 4 mg. per kilo of body weight adjusted to the nearest 50 mg. tablet, and also adjusted as the patient gained in weight. Ten grams of sodium para-aminosalicylate in solution was given daily to adults and for children the dosage was scaled down according to body weight. No form of collapse therapy was used on this group of patients and they were encouraged to use full lavatory privileges as soon as they were physically able to be up. The original culture was kept for comparison with subsequent cultures to determine whether bacterial resistance was present or if it developed.

The two groups are similar in number of patients, sex, color and even in the age groupings. Vital statistics for Group II appeared in previous article in this Journal.¹

Sixty-seven patients in Group I had collapse therapy at some time; in sharp contrast, no collapse therapy was done on Group II patients. All collapse therapy on Group I was abandoned by December of 1952.

COMPARISON OF RESULTS

TABLE I—BACTERIOLOGICAL EVALUATION

	Conversion of Cultures by Month			
	110 Patients Group I		101 Patients Group II	
	No.	Per Cent	No.	Per Cent
1st Month in the Hospital	7	6.37	56	55.45
2nd Month	15	13.63	21	20.79
3rd Month	8	7.27	8	7.92
4th Month	13	11.81	5	4.95
5th Month	10	9.10	5	4.95
6th Month	7	6.37	2	1.98
7th Month	2	1.82		
8th Month	1	0.91	1	0.99
9th Month	2	1.81		
10th Month	6	5.45		
11th Month	1	0.91		
12th Month	5	4.55		
Over 12 Months before converting cultures	30	27.27		
Proven by Pathological Specimen	3	2.72	3	2.97
Average Time Positive	10.1 Months		2.05 Months	

Bacteriological Evaluation: In group I there is no clear cut period during which the patients have culture conversions. Among Group II patients, however, 99 per cent were negative within six months with most of the change occurring during the first two months. It is not possible

to compare the resistance of organisms before starting the drugs because no sensitivity studies had been made on 58 in Group I. Those who did not convert readily were tested, the results showing that 13 had organisms resistant to streptomycin, 11 were resistant to isoniazid and three to both drugs. One in Group II was streptomycin resistant at onset of treatment and required five months to convert. Six had isoniazid-resistant bacilli at the onset of treatment and for five of them, the period of time before conversion was prolonged; two converted at four months; and three at five months. The patient who was positive over six months developed organisms that are resistant to isoniazid; he was resected and is now negative.

Surgery: We recommend surgery when: 1. the patient has been positive for three months or more after receiving all three drugs; 2. when there are extensive localized areas of destruction with or without bronchial stenosis; 3. when the patient is not likely to accept any prolonged period of hospitalization (alcoholics, etc.); 4. when portions of the lung bound down by adhesions may be salvaged by decortication; 5. when a patient is readmitted after having had conventional therapy; and, 6. when surgery represents a last possible chance for the patient to live outside the hospital even though he may be a respiratory cripple. All candidates for surgery then have anterior-posterior tomographs, bronchoscopy using foroblique and right angled telescopes, an electrocardiograph, and any complicating disease such as diabetes, hypertension or asthma is evaluated and treatment is instituted to control them during resection and convalescence. If bronchoscopy reveals marked redness and swelling, then surgery is delayed two months and bronchoscopy is repeated.

Table II represents a comparison of pulmonary and extrapulmonary surgery and postoperative complications. The four primary thoracoplasties in Group I were done in 1951 and none have been done since. The average time between admission and surgery is significant; Group I requiring over three times the number of hospital days in order to be considered as good surgical risks. Early surgery is possible in Group II because of three main factors: 1. shown roentgenographically, maximum clearing had taken place at the end of six months, with most of the change occurring during the first three month period; 2. pathologically, any clearing seen in the films after five months was due to shrinkage of the destroyed areas or the spitting out of the caseous material—the clearing was not associated with restoration of function; and, 3. the acute bronchitis had subsided within three to four months from time of admission using the three drugs. X-ray film clearing in Group I was variable and active bronchitis was frequently present after 12 months in the hospital. Two major factors are responsible for our high incidence of positive cultures following surgery in Group I: first, chemotherapy was stopped six to eight weeks following surgery, resulting in a recurrence of positive cultures three to five months postoperative; when these patients were again given chemotherapy their cultures became negative and they have since been discharged. Second, organisms resistant to streptomycin and/or isoniazid were present. Two

TABLE II
PULMONARY SURGERY

	Group I	Group II
Thoracoplasty, Primary	4	None
Pneumonectomy	3	1
Lobectomy	12	5
Lobectomy plus a Segment	8	4
Segmental	11	12
Decortication	None	1
Total	38	23
Average time from admission to surgery	471 days	144 days
POSTOPERATIVE COMPLICATIONS		
Positive Cultures after Surgery	13	1
Still Positive	2	None
Bronchopleural Fistula	6	1
Streptomycin Resistant Organisms Present	8	None
Isonicotinic Acid Hydrazide Resistant Organisms	3 (2 still positive)	2
Miscellaneous Preoperative Problems	1 hypertensive 3 diabetics 1 severe asthma	1 severe asthma
Miscellaneous Postoperative Complications	1 coronary occlusion 2 depressive psychosis	None
Postoperative Spread of Disease	1	None
Deaths	3	None
EXTRA PULMONARY PROCEDURES		
Fusions of the Spine	2	3
Fusions of the Knee	None	2
Saucerization of TB. of Fibula	None	1
UROGENITAL TUBERCULOSIS		
Nephrectomies	None	3
Orchidectomy plus Sinus Tracts Resection	1	1
Ureteral Transplant to the Bowel	None	1
Total with Surgery	41	34

patients are still positive and have bronchopleural fistulae as well as organisms resistant to streptomycin and isoniazid. One with bronchopleural fistula died postoperatively of aspiration pneumonia. The four other bronchopleural fistulae have been closed by primary suture and small thoracoplasty. We have seen no spread of disease in any bronchopleural fistula. The one who had postoperative spread had streptomycin resistant organisms. Isoniazid was continued, the disease cleared and he has been discharged.

In Group I, 19 were positive before surgery. Only 18 specimens were cultured. In Group II, specimen cultures after resection were similar to the last gastric culture before surgery, being positive for three who were positive before surgery. Two specimens were positive even though the patient had been negative for three to six months. These positive specimens contained: 1. caseous areas measuring 2.5 cm.; 2. cavities with thick caseous walls; 3. silico-tuberculosis, and 4. bronchial disease.

Early surgery was done in extrapulmonary tuberculosis as well and the results were most gratifying with rapid deposit of bone in all fusions and clean primary closure of all incisions.

COMPARISON OF RESULTS BETWEEN THE TWO GROUPS

In both groups, those patients with minimal tuberculosis converted at a comparable time; i. e., 1.75 months in Group I and 1.33 months in Group II. Beyond that, however, great differences are observed.

The moderately advanced cases in Group I required half again as much

TABLE III

Stages	Group I			Group II		
	No. of Patients	Aver. No. Hospital Days	Aver. No. Months Positive	No. of Patients	Aver. No. Hospital Days	Aver. No. Months Positive
Minimal	4	359	1.75	4	286	1.33
Moderately Advanced	44	436	5.5	38	202	1.68
Far Advanced	49	750	13.8	36	270	2.78
Primary	0			6	190	
Extra Pulmonary	2			12	162	
In-Patients	3			None		
Deaths	8			5		
Over-all Average	110	661	10.1	101	222	2.05
Drugs Received						
Streptomycin		230			232	
PAS		274			166	
Isoniazid		188			227	

hospitalization as minimal tuberculosis in the same group, and the far advanced cases required 750 hospital days, twice as much time as the minimal cases. In Group II, it is apparent that there is little relationship between the extent of the disease and the number of hospital days required. A comparison of the overall averages for both groups reveals a startling fact: the 222 days of hospitalization for Group II represents 34 per cent of the 661 days of hospitalization for Group I, or, in other words, a decrease of 66 per cent of the amount of time in the hospital. This too is interesting: the conversion rate in Group I is in proportion to the amount of disease, while in Group II there is little relationship between extent of disease and the conversion rate.

One hundred and four patients in Group I received more streptomycin and para-aminosalicylic acid than the patients in Group II. Only 80 patients in Group I received isoniazid. Any chemotherapy received after discharge from the hospital is included in the figures in Table III.

Three patients from Group I are still in the hospital.

Regarding the deaths listed in Table III, Group I had three postoperative deaths, two tuberculosis deaths—both old men with chronic disease; and three deaths were from other disease with tuberculosis as a complicating factor. Group II, in contrast, had no postoperative deaths, three tuberculosis deaths occurring in children under 2½ years with miliary disease plus meningitis, living only from five to 41 days after admission, and two deaths from other disease with tuberculosis as a complicating factor. Our autopsy rate for both groups is 77 per cent.

COMPARISON OF RESULTS

Toxic Reactions to the Drugs: After the acute reaction to streptomycin subsided, four of the total of five patients who had dermatitis medicamentosa were given 0.1 gm. dihydrostreptomycin and the dosage was increased 0.1 gm. daily until they were receiving 1 gm. twice a week. Toxic nephritis occurred from dihydrostreptomycin after a previous streptomycin reaction in three of the four patients.

The incidence of toxic reactions is similar in both groups; a total of nine in each group and they occur within the same range of time. All of the acute reactions took place within the first 50 days of treatment.

Follow-Up of Discharged Patients: All adult patients receiving regular discharges (93 per cent of all our discharges) have anterior-posterior tomographs during their hospital stay. All but two of these 196 discharged patients in the combined groups have been followed in regularly scheduled clinics in the Health Departments of the respective six counties which we serve. Medical personnel from the Central Washington Tuberculosis Hospital hold these clinics.

In Group I there have been 10 reactivations and they fall into four categories: 1. Six who had no chemotherapy or inadequate chemotherapy by Group II standards during their first admission—three of them have since received the three drugs, and the other three have been resected because of large caseous lesions and given the three drugs for over six

months. All six have returned to their previous occupations; 2. Two with resistant organisms have been treated with antibiotics to which their organisms are sensitive and are now discharged; 3. One who had a streptomycin reaction, then a toxic nephritis from dihydrostreptomycin is now responding to isoniazid and para-aminosalicylic acid, and 4. One who had adequate chemotherapy by Group II standards and whose left upper lobe was resected during her first admission reactivated around the caseous disease in the right upper lobe, and had such poor respiratory function that a second resection was impossible. She is now receiving "long term chemotherapy."

All Group II patients returned to their previous occupations regardless of physical activity immediately upon discharge. Seventy have had one or more gastric culture since discharge. There have been three reactivations; one had more chemotherapy than average for the group—bronchoscopy and resection revealed bronchial stenosis of the right upper lobe bronchus and bronchiectasis of the apical and posterior segments; two had less chemotherapy than average (185 days)—one has a cavitary lesion in a destroyed right upper lobe and had refused resection at time of first admission, and the second, who had left A.M.A., has a caseous mass in the right upper lobe that is over 2½ cm. in diameter, together with a smaller caseous mass in the left upper lobe. His right upper lobe has been resected.

Thus it is obvious that there is a significant difference in reactivations of tuberculosis between Groups I and II, and physical activity is not a factor in reactivation of the disease among our patients who have had all three drugs and early resection. To date, no Group II surgical patient has reactivated. Their period of hospitalization is only 30 days longer than the average, and they received 60 days more streptomycin and isoniazid.

The fusions of the spine were in a cast postoperatively for four months, then in a brace for nine months to one year. Two are out of their braces now and the knee fusions have had no support since their cast after surgery.

Discussion

This is a comparison study of two different methods of treating both pulmonary and extrapulmonary tuberculosis, summarized at the end of two years. We have been trying to find solutions to the three major problems in the treatment of tuberculosis; i.e., bacterial resistance, loss of blood supply to the diseased area and bronchial disease. Our methods are the use of streptomycin, para-aminosalicylic acid and isoniazid given continuously and concurrently, and resection of those areas which we know have little or no blood supply within four to six months after starting drug therapy.

When comparison is made between our present routine and conventional treatment, these facts stand out:

1. In Group II 99 per cent had negative cultures at the end of six months and all were negative by the end of one year, against 57.27 per cent in Group I.

2. They were positive only one-fifth as long; 2.05 months in Group II—10.1 months in Group I.

3. They came to surgery in one-third the time, had no deaths and few complications—144 days from admission compared with 471 days in Group I.

4. They were hospitalized only one-third the time; 222 days against 661 days for Group I, and all of Group II have left the hospital—three of Group I have been hospitalized continuously.

5. They had less than one-third the readmissions even though they returned immediately to their previous occupations—three vs. 10.

We feel that our results with Group II are due to several factors:

1. We have fulfilled the three basic requirements for the use of antibiotics, i. e.:

First: the organisms should be sensitive to the drugs used so routine sensitivity studies are done on all admissions and subsequent cultures because resistant organisms are found even when the patient has never received a certain drug; resistance to one drug delays conversion of cultures and is a definite cause of postoperative complications and reactivations.

Second: The drug must penetrate to the tubercle bacillus. A. P. tomographs have been done routinely at the end of three months hospitalization to determine the type of lesions present. Resectional surgery is indicated to remove those areas into which the drug does not penetrate, caseous areas over 2½ cm. or cavities with thick caseous walls or areas with poor bronchial drainage due to bronchial stenosis or bronchiectasis. Pneumothorax and thoracoplasty are counter-indicated because they decrease the blood supply to the lesion and the patient suffers a loss of pulmonary function even greater than resection.^{3, 9} We recommend resectional surgery at this four to six month period because:

- a. Spontaneous conversion of culture rarely occurs after six months of chemotherapy alone.
- b. Bacterial resistance develops in those positive over six months.
- c. Acute bronchitis has subsided by four months so the bronchus can be closed.
- d. Surgery is technically easier because of fewer adhesions, there is no sputum to obstruct the airway and resection of a large diseased area on one side has a beneficial effect on the disease on the opposite side.
- e. X-ray clearing after five months is due to shrinkage of the lesion or liquefaction of the caseous material, not to restoration of function.
- f. We did not restrict activity during hospitalization so patients are in better physical condition at time of surgery.

- Third: The drugs must be continued in adequate dosage for a sufficient period of time. Only two patients in Group II had more than one year of chemotherapy or hospitalization so it would seem that if chemotherapy is to be effective the combination of all three drugs must be used from six months to one year and any reactivation of disease is due to viable bacilli in an area where drugs cannot reach them and not to physical exertion.
2. All three drugs were given continuously and concurrently, not in courses and we feel that the three used together are better than any combination of two after three months of treatment with a higher conversion rate at six months and no change in bacterial resistance until after six months of treatment.
 3. Returning the discharged patient immediately to his previous occupation has already affected public welfare in our area by decreasing the financial assistance to the patient and his family, by keeping families together and, rather than long retraining programs, the Rehabilitation Department has helped secure jobs.
 4. Our program has received splendid patient cooperation as shown by the few irregular discharges, dropping from 20 per cent in 1951 to 6 per cent in 1952, and by the willingness of the patient to return for follow-up after discharge. It has also left no chronic tuberculosis.

CONCLUSIONS

1. The use of antibiotics in the treatment of tuberculosis should follow the same basic requirements as the use of antibiotics against any other bacterial disease. An adequate period of treatment with the three drugs lies between six months and one year.
2. Three drug therapy of tuberculosis (streptomycin, PAS and isoniazid) offers a slightly higher conversion rate in the first six month period than previously reported, with the additional advantage of having no change in bacterial sensitivity until after the six month period.
3. All toxic reactions to the three drugs occur during the first 50 days of treatment except for nephritis which may appear later, and it occurred in three out of four patients who had dihydrostreptomycin after a dermatitis medicamentosa from streptomycin.
4. Resectional surgery four to six months after starting chemotherapy is advisable and safe on the three drug routine.
5. Marked restriction of activity is not necessary during hospitalization and full activity does not cause reactivation after discharge.
6. This program of three drugs with early surgery is as effective in extra-pulmonary disease as in pulmonary, and there are no racial differences in regard to response.
7. This program has received splendid patient cooperation.
8. It has left no chronic tuberculosis.

CONCLUSIONES

1. El uso de los antibióticos en tuberculosis debe ajustarse a los mismos requisitos básicos que rigen el uso de los antibióticos contra cualquiera otra enfermedad bacteriana. El período adecuado de tratamiento con estas drogas dura de seis meses, a un año.

2. El uso de las tres drogas (estreptomina, PAS e isoniacida) ofrece una proporción de negativaciones ligeramente más alta al cabo de seis meses, que la antes reportada con la ventaja adicional de que no hay cambio en la sensibilidad bacteriana sino hasta después de seis meses.

3. Todas las reacciones tóxicas a las drogas acontecen durante los cincuenta primeros días de tratamiento con excepción de la nefritis que puede aparecer más tarde y ocurre en tres de cuatro enfermos que han recibido dihidroestreptomina después de que ha aparecido dermatitis medicamentosa por el uso de la estreptomina.

4. La cirugía de resección de cuatro a seis meses después de empezada la quimioterapia es aconsejable y segura usando las tres drogas como rutina.

5. No se necesita una marcada restricción del ejercicio durante la hospitalización y la actividad plena no causa reactivación después de darlos de alta.

6. Este plan de usar las tres drogas con cirugía temprana es tan efectiva en tuberculosis extrapulmonar como en la pulmonar y no hay diferencias raciales con relación a la respuesta al tratamiento.

7. Este plan ha recibido una espléndida cooperación por parte de los enfermos.

8. No ha dejado tuberculosis crónica.

RESUME

1. Dans le traitement de la tuberculose, l'utilisation des antibiotiques devrait suivre les mêmes règles fondamentales que celles qui sont appliquées pour toute autre maladie infectieuse. Le traitement par les trois produits doit s'étendre sur une période de six mois à un an.

2. L'utilisation des médications de la tuberculose (streptomycine, P.A.S., isoniazide) entraîne un pourcentage de guérison légèrement plus élevé que les auteurs ne l'avaient rapporté primitivement. Il se'y ajoute l'avantage de n'entraîner aucune modification de la sensibilité dans les six premiers mois.

3. Toutes les réactions toxiques de ces trois produits surviennent pendant les cinquante premiers jours de traitement. La néphrite fait exception et peut apparaître plus tard: elle survient chez trois malades sur quatre à qui on a administré de la dihydrostreptomycine après une dermatose médicamenteuse provoquée par la streptomycine.

4. La chirurgie d'exérèse après quatre ou six mois de chimiothérapie est judicieuse et sans risque, sous contrôle des trois produits.

5. Il n'est pas nécessaire d'exiger un très grand repos. La reprise d'une activité normale après la sortie de l'hôpital ne risque pas d'entraîner une rechute.

6. Ce programme thérapeutique par les trois médications et la chirurgie précoce est aussi efficace dans les affections extra-pulmonaires que pulmonaires que pulmonaires, et les résultats sont les mêmes quelle que soit la race du malade.

7. Ce programme thérapeutique a suscité une magnifique coopération de la part des malades.

8. Il a permis d'éliminer toute évolution tuberculeuse chronique.

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Irregular Discharges of Tuberculous Patients: An Analysis of 273 Cases*

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The high irregular discharge rate of patients from most tuberculosis hospitals throughout the country is well known. It is thought by Weber² to average 40 per cent of all discharges and to represent one of the most serious problems in the management of tuberculosis patients. The rate of irregular discharges** of tuberculous patients who are beneficiaries of the Veterans Administration*** from Fitzsimons Army Hospital has been a problem under study for some time. In order to ascertain if there is some common denominator for the cause of this high rate at this hospital, an analysis was made of 273 cases irregularly discharged in 1952. It was hoped that in uncovering the various factors involved in the irregular discharges, appropriate new correctional measures might be taken, or existing facilities strengthened. This evaluation of patient facilities was deemed especially important because Fitzsimons Army Hospital has those resources found necessary for good medical care; namely, personal physician and nursing care, patient educational programs, medical social work, chaplain counseling, psychiatric consultation, rehabilitation counseling.

Fitzsimons Army Hospital, is, in part, a tuberculosis hospital serving approximately 1200 tuberculosis patients, made up of military personnel, veteran patients and civilian dependents of military personnel. In addition to extensive treatment facilities, a research and training program is established at this hospital. The strict bed rest treatment program as outlined by the National Tuberculosis Association is followed. On the admission ward, each patient is given individual, as well as group, orientation to tuberculosis by the patient educator, a public health nurse. Education to tuberculosis is a continuing process for each patient as he transfers from the admission to the treatment ward. On admission, each patient is interviewed by the medical social worker who gives the searched for and understanding to patient needs. Social and emotional problems are recognized and professional service is offered by the social worker who shares her findings with the medical team. Each new patient is seen by the rehabilitation counselor, the chaplain, the American Red Cross worker, and the occupational therapist, all of whom focus on helping the patient make a constructive adjustment to his illness.

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**Irregular Discharge, as defined by Tollen,¹ means "any termination of hospitalization of a living patient which is not medically sanctioned by professional authority."

***Tuberculous Beneficiaries of Veterans Administration are hospitalized at Fitzsimons Army Hospital under contract with the Veterans Administration. Such beneficiaries of the Veterans Administration will be referred to in this paper as "veteran patients."

In 1952, 378 veteran patients were treated and discharged at Fitzsimons Army Hospital.³ Of this group, approximately 50 per cent received maximum hospital discharges, and 50 per cent left with irregular discharge. Of the civilian dependents, 159 were treated in 1952 with approximately 20 per cent leaving irregularly. Of the military personnel, 636 were treated in 1952, with less than 2 per cent leaving with irregular discharge. In 1952 a total of 1173 individual patients were observed, treated, and discharged from the tuberculosis section of the medical service, Fitzsimons Army Hospital. Of this total group treated and discharged, 873 (74 per cent) received regular discharges.

Method

This analysis of all patients discharged against medical advice was made by a medical team composed of the ward physician, the physician in charge of the veterans' section, a medical social worker, the public health nurse, and an education counselor. Every possible source of information was utilized in the analysis, including medical charts, social case work records, and personal knowledge of the patient by the attending ward officers, nurses, social workers, and education counselor. In the analysis of each case, the following information was evaluated: age, sex, previous admissions to tuberculosis hospitals, previous irregular discharges, and residence; extent, activity, and length of time of disease; length of hospitalization; enrollment in educational programs; number of discharges following surgery; patient's reasons for leaving the hospital, and, lastly, the professional team's analysis of the reasons for leaving the hospital.

Evaluation

Tables I through X summarize the accumulated data of 273 cases of irregular discharges for the year 1952. Of these 273, 42 (17 per cent)

TABLE I
ACTIVITY OF TUBERCULOSIS ON DISCHARGE

Clinical Status	Number	Per Cent
Active	239	88
Arrested	25	9
Inactive	9	3
TOTAL	273	100

TABLE II
EXTENT OF DISEASE ON DISCHARGE

Extent	Number	Per Cent
Minimal	21	8
Mod. Adv.	105	38
Far Adv.	137	50
Pleural Effusion	4	1.6
Nodes	4	1.6
G. U.	2	0.8
TOTAL	273	100.0

TABLE III
LENGTH OF TIME OF DISEASE ON ADMISSION TO FAH

Duration	Number	Per Cent
Less than 1 year	66	24
1-2 years	41	15
2-4 years	63	23
4-8 years	50	19
8-14 years	25	9.2
Over 14 years	28	9.8
TOTAL	273	100.0

TABLE IV
TOTAL NUMBER OF IRREGULAR DISCHARGES:
BY REPEATERS & NON-REPEATERS

	Number	Per Cent
First irregular discharge	176	64
Repeaters of irregular discharges	97	36
TOTAL	273	100

represent re-admissions of the same veteran patients during the year 1952. Of the remaining 231, 178 (77 per cent) were veterans, 41 (17 per cent) were civilian dependents, and 12 (6 per cent) were military patients. For purposes of this study, all irregular discharges were individually evaluated and included the 42 "repeaters" for 1952.

Comments

Certain facts obtained from the table summarization bear emphasis. Eighty-eight per cent of those irregularly discharged in 1952 had "active" tuberculosis according to national tuberculosis association standards. Fifty per cent of them had "far advanced" pulmonary tuberculosis. Sixty-one per cent of these same patients had disease of more than two years' duration. Immediately, these facts point up the serious public health problem of community contact with those who may be considered chronic carriers of tuberculosis. To further emphasize the scope of this problem, it should be noted that 36 per cent are "repeaters" of irregular discharges from this and other tuberculosis hospitals. Furthermore, 64 per cent of the irregularly discharged stayed in the hospital less than six months, with 22 per cent staying less than one month. From this data, it is apparent that those with more chronic disease, and therefore more discouraging treatment results, are less inclined to tolerate long hospitalization.

Only 6.2 per cent leaving with irregular discharges were enrolled in some type of educational program. This fact indicates a general lack of desire for rehabilitation among many, in spite of efforts to motivate them for retraining.

Sixty-one per cent of the 273 leaving with irregular discharge had residence outside the State of Colorado, while only 27 per cent were residents of the City of Denver. However, approximately the same percentage of out-of-state residents received regular discharges. Neverthe-

less, this factor of lack of proximity to home is considered by both the patients and the medical team as a cause of dissatisfaction, and in part, accounts for some inability to adjust to hospital life.

To further evaluate the causes of irregular discharges, all leaving irregularly were requested to submit in their own words their reasons for leaving. Table IX tabulates the breakdown of the reasons, which, understandably, are subjective in nature and reflect only that which the patient desires to give as an acceptable answer. Of the total number of 273 irregular discharges, 123 (45 per cent) stated that they could not adapt themselves to hospitalization. A significant number, 29 (10 per cent) preferred to be treated by a private doctor, and an additional 22 (8 per cent) stated that they were unable to tolerate the monotony, confinement, and regulations of hospital life.

Of the 273, 59 (21 per cent) gave personal problems as their reasons for leaving. Of this group with personal problems, 23 (9.5 per cent) stated they had marital problems which they preferred to solve themselves, despite attempts by social service, American Red Cross, and other agencies to help them. Thirteen (4 per cent) stated that they were seeking hospitalization nearer home. Family responsibility and financial problems were reasons given by a combined total of 19 (6.5 per cent).

Thirty-two (only 12 per cent of the total number) requested irregular discharges because of refusal to accept recommended treatment. They were mostly those that desired to control their own treatment program. Some had realistic fears of one or more of the recommended treatments suggested.

The professional team, recognizing the subjective nature of the above reasons, compiled Table X in order to evaluate more objectively the basic reasons for irregular discharge.

TABLE V
LENGTH OF TIME IN HOSPITAL

Duration	Number	Per Cent
0 to 6 months	175	64
6 to 12 months	68	25
12 to 18 months	24	9
18 to 24 months	3	1
Over 24 months	3	1
TOTAL	273	100

TABLE VI
LESS THAN 6 MONTHS HOSPITALIZATION

Duration	Number	Per Cent
0 to 1 month	39	22
1 to 3 months	56	32
3 to 6 months	80	46
TOTAL	175	100

TABLE VII
IRREGULAR DISCHARGES ENROLLED IN
EDUCATION PROGRAM

	Number	Per Cent
First discharge	8	2.9
Repeater	9	3.3
TOTAL	17	6.2

TABLE VIII
RESIDENCE ON DISCHARGE

Residence	No. of Patients	Per Cent
Denver	74	27
Colorado	31	12
Out of State	168	61
TOTAL	273	100

The number that the medical team considered unable to adapt to hospital life was 62 (22 per cent), a much smaller number than listed under patient's reasons for irregular discharge. This finding undoubtedly reflects the overall attempt of the medical team to categorize more specifically the reasons for discharge. Furthermore, it points up the tendency of patients to project onto the "hospital life" their reason for leaving, thus covering up a multitude of personal problems, inadequacies, or such factors as inability to accept their disease as a reality. Twenty-three (8 per cent) of this group preferred to control their whole treatment program. Nineteen (7 per cent) of this group were considered to have excessive dependency needs not satisfied by hospitalization.

Seventy-four (27 per cent) were categorized as leaving for personal reasons. Marital problems again headed the list, with 28 (10 per cent) leaving for this reason. The remainder of the reasons covered a wide spectrum.

It is significant that the medical team found 81 (30 per cent) who did not accept recommended treatment. Of this group, 45 (16 per cent) were unable to accept their disease as a reality. Fears of treatment and patients preferring to control their definitive treatment programs made up the remainder of this group.

A total evaluation of Tables IX and X indicates that there are almost as many reasons for irregular discharge as there are patients. The basic problems are extremely complicated and vary from dependent personality patterns to simple home financial problems, all prodding the patient to terminate his hospitalization before he is well. Emphasis should again be given to those who are unable to accept their disease as a reality, or prefer to control their own treatment program.

The high percentage of irregular discharges of the veteran patients as compared with the other two groups studied, also deserves comment. The rigid discipline of the military patients, with respect for military law,

certainly is reflected in the low irregular discharge rate from this latter group. On the other hand, the financial independence and availability of hospitalization and medical care are factors to consider in evaluating the high irregular discharge rate of veteran patients. The military patient undoubtedly has many personal problems, as does the veteran patient, but the latter is free, as is any civilian, to terminate his medical care when he wishes. This individual freedom to terminate hospitalization when one pleases, does pose a serious public health and community problem; and points up the need to strengthen, by law, state control of the hospital-

TABLE IX
PATIENT'S REASONS FOR IRREGULAR DISCHARGES

Reason	Number	Per Cent of Total
I. No Reasons:	59	22
II. Unadaptability to Hospital Life:	123	45
a. Continue treatment at home with private doctor	29	10.6
b. Leave request denied	7	2.5
c. Refused to accept protective treatment ward	27	9.8
d. Inability to tolerate monotony, confinement and regulations	22	8.0
e. Dissatisfied with food	2	.6
f. Ward too noisy	2	.6
g. Ward unclean	1	.3
h. Lack of personal attention	1	.3
i. To be with family	7	2.4
j. Discouraged with progress and his case	10	3.5
k. Unable to accept Army regimen	12	4.6
l. Unhappy about coming to FAH	3	1.8
III. Personal Problems:	59	21
a. Details not given	4	1.0
b. Marital problems	23	9.5
c. Financial problems	9	3.5
d. To seek hospital nearer home	13	4.0
e. Assume family responsibility	10	3.5
IV. Refused to Accept Recommended Treatment:	32	12
a. Drugs	2	.5
b. Refusal to accept bronchoscopy	1	.5
c. Refusal to accept surgery	5	1.0
d. General dissatisfaction with treatment program	24	10.0
TOTALS	273	100

ization and treatment of these tuberculous patients who demonstrate their inability to accept responsibility for their treatment. Before any further significant reduction in the irregular discharge rate can be made, compulsory isolation must be accomplished. Willner⁴ agrees that "compulsory isolation is unwelcome, but is essential when a patient who is a menace to others refuses a non-coercive treatment program". Northrop⁵ shows, that in the State of Washington, forcible isolation of the recalcitrant patient has little negative reaction and, in fact, has developed tractable, cooperative patients. Another approach to this problem could be the discontinuance of pensions and compensation to veterans who refuse

TABLE X
MEDICAL TEAM ANALYSIS OF REASONS
FOR IRREGULAR DISCHARGE

Reason	Number	Per Cent of Total
I. Reasons Not Known to Med. Team:	43	16.0
II. Unadaptability to Hospital Life:	62	22.0
a. Patient preferring to control whole treatment program	23	8
b. Refusal to accept protective treatment ward	9	3
c. Inability to tolerate monotony, confinement and regulations	11	4
d. Patients with excessive dependency needs not satisfied by hospitalization	19	7
III. Personal Problems:	74	27.0
a. Marital Problems	28	10
b. Financial Problems	5	2
c. Seek hospitalization nearer home	6	2
d. Unable to release family responsibility	10	4
e. Alcoholism	11	4
f. Patient mentally ill	2	1
g. Using hospitalization as secondary gain	5	2
h. Embarrassment over pregnancy and indiscrete behavior	7	2
IV. Refusal to Accept Recommended Treatment:	81	30.0
a. Unable to accept disease as a reality	45	16
b. Patient preferring to control definitive treatment	13	5
c. Fear of treatment	4	2
d. General fears of surgery	6	2
e. Fear of death	3	1
f. Patient unable to accept medical authority	10	4
V. Feel Discouraged with Progress of Disease:	13	5.0
TOTALS	273	100.0

recommended hospitalization and treatment, since the purpose of "compensation paid until health is regained" is being defeated. The cost of tuberculosis care to the people of this country is tremendous and, as Frost⁴ emphasizes, the cost estimates do not include the losses in wages, lowered production, and broken homes.

SUMMARY AND CONCLUSIONS

1. An analysis has been made of the irregular discharge of 273 patients with pulmonary tuberculosis from Fitzsimons Army Hospital in 1952.

2. This study demonstrates that there are numerous causes for irregular discharges of tuberculous patients. Many studied were unable to accept their disease as a reality, despite thorough educational programs in tuberculosis. Furthermore, a large number of them desired to control their treatment in spite of the fact that the financial responsibility for treatment was borne by the Veterans Administration and not by themselves. Lack of proximity to home was also considered a factor in patient dissatisfaction and resulting irregular discharge. Lack of emotional maturity to adjust to prolonged hospitalization was the basis of many irregular discharges.

3. Eighty-eight per cent of those irregularly discharged had active tuberculosis on discharge. Fifty per cent of these same patients had far advanced tuberculosis. Thirty-six per cent of these patients were "repeaters" of irregular discharges.

4. The long hospitalization necessary today for adequate treatment of tuberculosis brings with it the intolerance of monotony and the struggle with dependency. In spite of the medical team's efforts to help with these problems, many patients find the solution to their problems in the rejection of adequate medical care.

It is anticipated that if the future treatment of tuberculosis includes shorter hospitalization, these problems will be reduced. However, until such time as medical science and research can offer short-term treatment for tuberculosis, the problems of this chronic disease must be met realistically. Tuberculosis is a serious communicable disease which should require isolation, enforceable by law. New cases of tuberculosis are being diagnosed every day because our present systems of control are inadequate. The figures in the study, and the experience of treating many thousands of patients with tuberculosis, have convinced us that the general welfare of every community demands more adequate protection against tuberculosis.

RESUMEN Y CONCLUSIONES

1. Se ha hecho un análisis de las salidas irregulares del Hospital Fitzsimons del Ejército de 273 enfermos con tuberculosis pulmonar en el año de 1952.

2. Este estudio demuestra que hay causas numerosas para las altas irregulares de los tuberculosos. Muchos de los estudiados eran incapaces de aceptar su enfermedad como real a pesar de las tareas educativas muy

completas sobre tuberculosis. Más aún un gran número de ellos deseaban conducir el tratamiento por sí, a pesar del hecho de que la responsabilidad financiera dependía de la Administración de Veteranos y no de ellos mismos.

El alejamiento del hogar se consideró también un factor de descontento de los enfermos que conducía a la salida irregular.

La causa de muchas salidas irregulares fué la falta de madurez emocional para adaptarse a la hospitalización prolongada.

3. 88 por ciento de los que salieron irregularmente tenían tuberculosis activa al abandonar el hospital. Cincuenta y cinco por ciento de los mismos tenían tuberculosis muy avanzada. Treinta y seis por ciento de estos enfermos eran reincidentes de salidas irregulares.

4. La hospitalización prolongada necesaria actualmente para el tratamiento adecuado de la tuberculosis trae consigo la intolerancia de la monotonía y la lucha contra la dependencia. A pesar de los esfuerzos del grupo médico para resolver estos problemas, muchos enfermos hallaron la solución de ellos rechazando el tratamiento adecuado.

Se prevé que dado que en el futuro la hospitalización ha de ser menos prolongada, estos problemas disminuirán. Sin embargo, hasta que la ciencia médica y la investigación puedan proporcionar tratamiento a corto plazo de la tuberculosis, esta enfermedad debe encararse de manera realista. La tuberculosis es una enfermedad transmisible sería que debe requerir aislamiento obligado por la Ley. Debido a que nuestros sistemas de control son inadecuados todos los días se diagnostican casos nuevos de tuberculosis. Los números de este estudio y la experiencia tratando muchos millares de tuberculosos nos han convencido de que el bienestar general de toda comunidad demanda más adecuada protección contra la tuberculosis.

RESUME

1. Les auteurs ont fait l'analyse de 273 cas de malades porteurs de tuberculose pulmonaire, sortis sur leur demande de l'Hôpital d'Armée Fitzsimons, en 1952.

2. Cette étude montre qu'il y a de nombreuses causes de ces départs prématurés des malades tuberculeux. Beaucoup d'entre eux ne reconnaissaient pas qu'ils étaient véritablement malades, en dépit de nombreuses conférences éducatives qui leur furent faites sur la tuberculose. En outre, un grand nombre d'entre eux désiraient être maîtres de leur traitement, bien que la responsabilité financière en fût supportée par l'Administration des Vétérans et non par eux-mêmes. L'éloignement du foyer fut aussi un facteur important de mécontentement chez les malades, qui entraîna leur départ. L'absence de la force morale nécessaire pour supporter une hospitalisation prolongée fut à la base de beaucoup de départs irréguliers.

3. 88% de ces malades indisciplinés étaient porteurs de tuberculose active à leur sortie. 50% de ces malades étaient porteurs de lésions avancées. 36% de ces malades étaient des "récidivistes" des départs irréguliers.

4. La longueur de l'hospitalisation nécessaire pour mener à bien le traitement actuel de la tuberculose finit par rendre le malade incapable de sup-

porter la monotonie de son existence et les entraves à la liberté qu'elle nécessite. Malgré les efforts des médecins qui cherchent à atténuer ces inconvénients, beaucoup de malades trouvent la solution du problème en échappant à la surveillance médicale nécessaire.

Il serait excessif d'imaginer que si le traitement de la tuberculose comporte dans l'avenir un délai d'hospitalisation écourté, ces problèmes se trouveront réduits. Cependant en attendant que la science et la recherche médicales puissent offrir un traitement rapide de la tuberculose, les problèmes de cette affection chronique doivent être envisagés avec réalisme. La tuberculose est une maladie sérieuse, contagieuse, qui devrait entraîner l'isolement obligatoire. De nouveaux cas de tuberculose sont diagnostiqués chaque jour parce que nos systèmes actuels de lutte sont insuffisants. Les chiffres de cette étude et l'expérience que nous avons du traitement de milliers de malades porteurs de tuberculose nous ont convaincus que pour le bien de la collectivité il est nécessaire que soit instituée une protection plus efficace contre la tuberculose.

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Bronchography with Water Soluble Media

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Water soluble media have become increasingly popular in demonstration of body cavities and vascular beds. The viscosity of these solutions have been increased thus making it possible to obtain good roentgenograms, particularly of the bronchial tree. Their rapid elimination, absence of danger of oil embolism and rarity of idiosyncrasies should place them in a leading position in bronchography.

In this article there will be individual observations of 54 bronchographies with Ioduran B* and five cases Xumbradil viscous B**. The reason for this odd proportion will be explained later. All patients examined had pulmonary tuberculosis. Two of them have been subject to severe side reactions from previous attempts to fill their bronchi with Iodized Oil. Two other patients were known to be hypersensitive to Pontocaine. In these cases Xylocaine† anesthesia alone was used. A 100 milli-ampere machine without spotfilm device was used to produce these bronchograms. This factor the author wishes to use as an excuse for slight "blurring" of films caused by the movement of the patient while lateral and spotfilms were being taken. The latter exposures were taken against the fluoroscopic screen.

One who desires to learn the use of Iodized Oil in bronchography will no doubt have the benefit of being taught by experienced groups of investigators and schools. The water soluble contrast media have not had the benefit of the time as yet. An investigator, beginning to work with these substances, will most likely find the first few cases rather unsatisfactory, since the technique and anesthesia vary somewhat from that of Iodized Oil fillings. The damaging results of oily substances to the lung tissue include the causing of granulomatosis of the lung, at times lifelong residuals obscuring possible pulmonary disease or growth on roentgenograms, systemic reactions, oil embolism and decrease in pulmonary function due to granulomatosis. (Investigators have pointed out the side effects of swallowed oily preparations, since free iodine may be liberated on digestion). Cases of "lipoid pneumonia" have been reported.

Ioduran B causes inflammatory reactions in the lungs of test animals with complete disappearance within a short time. Similar changes were found in human lungs and are believed to be caused by the cellulose base of this medium.

The main advantage of water soluble media seems to be in the rapid elimination by expectoration and absorption. This fact permits one to obtain bronchograms of each side separately at short intervals. It has been

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*Ioduran B is manufactured by Cilag Ltd., Schaffhouse, Switzerland.

**Xumbradil viscous B is a product of Astra, Sweden.

†Xylocaine is a product of Astra Pharmaceutical Products Inc., Worcester, Mass.

said that free iodine will not be liberated on digestion if swallowed. Ioduran B (50 per cent diethanolamine salt of diiodopyridon-N-acetic acid and 2.5 per cent sodium salt of cellulose glycolic acid ether) is a highly viscous preparation. Xumbradil viscous B has basically the same chemical formula as Ioduran B. The difference is in viscosity, the latter being approximately half as viscous as Ioduran B. This explains the difference in filling of the bronchial tree. Xumbradil is supposed to give a mucosal coating, where ioduran B fills the lumen more completely. Viscosity of Ioduran B sometimes prolongs the filling time when finer bronchioles are to be demonstrated. In such cases four milliliters of Xumbradil viscous B should be added to 20 milliliters of Ioduran B. Both substances mix readily with bronchial secretions giving a more uniform outline of the bronchial tree than Lipiodol, which being an oily preparation does not unite with body fluids.

Technique

Premedications included 100 mg. Sodium Pentobarbital by mouth the night before and repeated one hour prior to examination. All patients



FIGURE 1 shows a case where the upper lobe is underfilled and the middle and lower lobes are overfilled. When the patient is required to walk from the table to the cassette, one should be sure that slight bending towards the filled side is maintained. This will prevent the medium from entering the contra-lateral side. The following illustrations are designed to show Ioduran B as a contrast medium.

were adults. At the beginning of the study 0.4 mg. of Atrophine Sulphate was given hypodermically one hour prior to the procedure. This medication was soon discontinued since the time of filling the bronchus was prolonged because of decrease of bronchial secretions. A rather wet bronchial tree was noticeably easier to fill in a shorter time, at least with Ioduran B. No narcotic was used to depress the cough reflex.

For topical anesthesia 2 per cent Pontocaine was used to spray the buccopharyngeal cavity lightly three to four times; then a mixture of 2 per cent Xylocaine and 2 per cent Pontocaine in proportions of two to one respectively was prepared. Xylocaine is not related chemically to Pontocaine, therefore it can be used independently to the amount of Pontocaine applied. Of this solution two milliliters were used to anesthetize the larynx and trachea. The drug was instilled fractionally by using only two to three drops at a time. This was done with the laryngeal spotting syringe and under the guidance of a mirror. When the drops into the

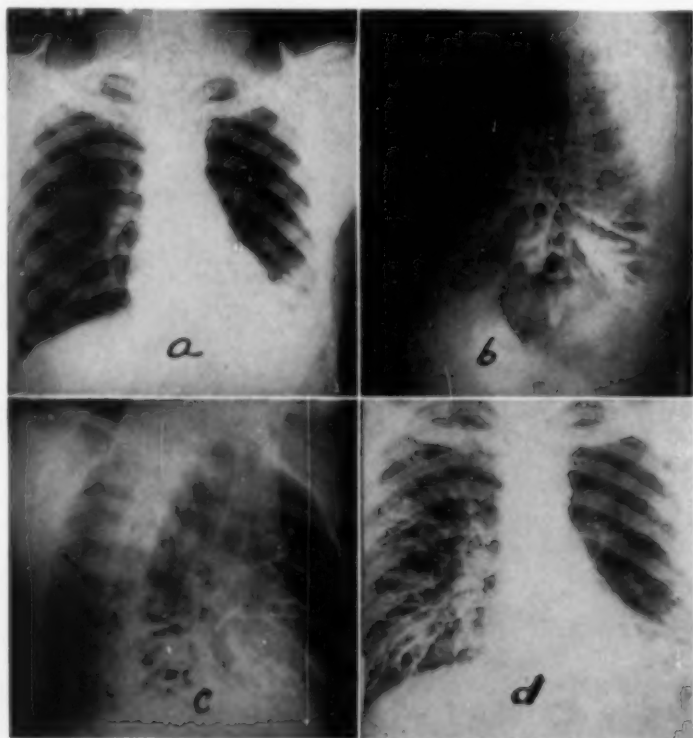


FIGURE 2 represents a 20 year old colored male with sputum positive for tubercle bacilli. Roentgenogram (a) showed moderately heavy density overlying the left hemidiaphragm. He expectorated a large amount of sputum especially in the early morning hours. Bronchography of the left side with Ioduran B, (b and c) demonstrated advanced bronchiectasis of the lower lobe. Six minutes later a bronchogram of the right lung was performed with the same medium (d). The left lung shows only increased bronchial markings and no residual of Ioduran B. Thus he had coughed up most of this medium within six minutes.

trachea no longer cause coughing, the catheter is then introduced on a stilet and under the guidance of a mirror. The tip of the catheter was introduced into the side to be examined, doing it fluoroscopically. It was positioned at the entrance to the upper lobe and the patient was instructed to take a postero-lateral position. The table was tilted with head down and two milliliters of 1 per cent Xylocaine instilled while the patient rotated forward so that the separate segments received sufficient amount of the anesthetic. To anesthetize the left upper lobe, it was necessary to tilt the table—feet downward—for the lingular part. The middle lobe was anesthetized following the upper with the patient placed on the abdomen and the tip of the catheter guided fluoroscopically into the bronchial orifice. Thereafter two milliliters of 1 per cent Xylocaine were instilled. The lower lobe usually received enough anesthetic from the upper lobe and trachea. Finally the tip of the catheter was passed through the bronchus and into the lower lobe segments to check the effect of the anesthetic. In these procedures, the catheter has a slightly curved tip thus permitting it to enter the different orifices with ease.

Filling of the right lung is done in the same manner, with Ioduran B as in anesthetizing the lung. Usually an assistant injects the medium slowly, while the operator controls the filling under fluoroscope and positions the patient. The slow injection of this viscous medium is quite

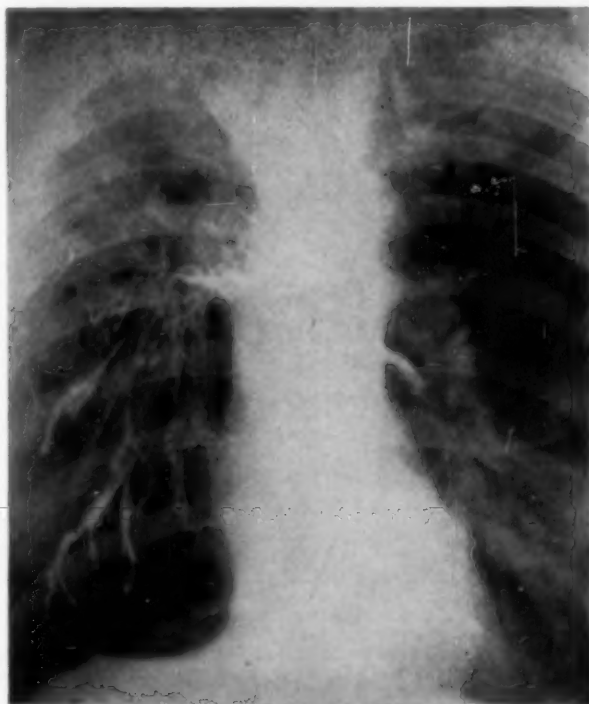


FIGURE 3 shows bronchiectasis of the right lung with Ioduran B filling.

important. It has a tendency to ascend around the catheter into the trachea and into the opposite main bronchus. This bronchus is not sufficiently anesthetized and will produce immediate cough, thus making the procedure a failure. This is particularly true for the right upper lobe, the entrance of which is only a short distance from the bifurcation. A spot-film is taken after satisfactory filling of the lobe. It can be done without a spotfilm device by holding the film cassette against the fluoroscopic screen.

The demonstration of the middle lobe should not be difficult. It can be done easily by following the anesthesia technique. Before setting the patient up, for the lower lobe filling, the superior segment of it is filled. The filling of the lingular portion of the upper lobe is a simple matter.

Bronchogram of the opposite lung can be done at the same session or the following morning. If it is desirable at the same sitting, patient sits

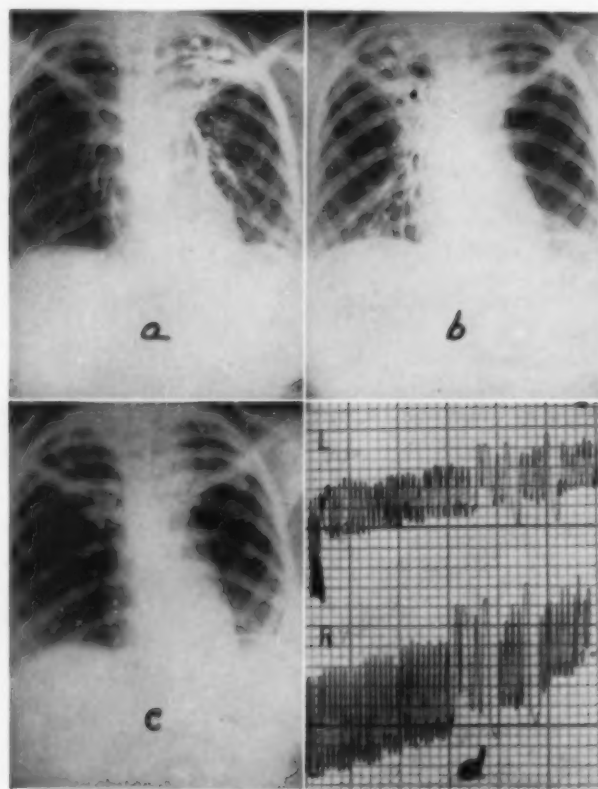


FIGURE 4 shows separate Ioduran B fillings of the left and right lungs. Both upper lobes have cavitary disease. Roentgenogram (c) of Fig. 4 taken 24 hours later shows no residual of the contrast medium. Chart (d) of Fig. 4 is a bronchspirometric tracing which indicates a considerable decrease in oxygen consumption, tidal volume, and vital capacity on the left (L) as compared to that of the right lung. The latter type of examination gives information about the loss of function of the more extensively involved left side. A paper on pulmonary function studies will be published later.

up with head bent forward and down, catheter is removed, and an effort made to expectorate Ioduran B. This is achieved within four to six minutes. A clean catheter is re-inserted and placed in the side to be examined. Additional anesthesia of 1 per cent Xylocaine was instilled through the catheter for the separate lobes.

One will be pleasantly surprised to find that the roentgenograms show almost no trace of Ioduran B on the side which was examined several minutes before. Here lies the great advantage of water soluble media. It serves well in cases where dyspnea prevents filling of the whole lung at once. In this event the separate lobes can be demonstrated in quick succession without dangerous decrease in breathing capacities. However, an aspirator should be kept handy, particularly when the whole lung is filled in an elderly individual with thick bronchial secretions.

Preoperative administration of Atropine in several cases added to the discomfort of the patient and diminished secretion of the bronchial tree. The latter fact increases the surface tension of the mucosa, requiring the addition of wetting agents to anesthetic media. Xylocaine causes more production of bronchial secretions than other topically used anesthetics. This was found to be beneficial in this type of work. The addition of one to three drops of 1:1000 Adrenalin and Privine to 1 per cent Xylocaine for anesthesia of the lower bronchial tree, decreases mucosal swelling and has been reported to prevent a possible bronchial spasm.

Discussion

Fifty-four cases were examined bronchographically with Ioduran B and five with Xumbradil viscous B. The latter substance proved unsatisfactory in all five cases. It was largely because of the low viscosity of Xumbradil which requires fast work and at least a unit of 200 milliamperes with spotfilm device. It was noticed that while a lobe was filled, a spotfilm had to be taken immediately; otherwise a diffuse filling of fine bronchioli resulted. This, of course, gives an impression of "alveolar" filling. With better equipment and faster work, one could get satisfactory results.

There were four unsuccessful attempts out of 54 Ioduran B cases. All four coughed it up before pictures could be taken. Two of them had active endobronchial disease, proved later by bronchoscopy and should not have had bronchography. The other two expectorated because of operating mistakes. In one of them, with patient lying flat, we injected the medium into the right upper lobe too fast. As a result the contrast medium ascended along the catheter into the trachea and larynx with resulting cough. It is important to take notice of this if there is work to be done with Ioduran B. In the other patient, the anesthetic agents were employed too fast resulting in poor anesthesia, and leading to cough. It might be worth while to mention that once cough has occurred, no local anesthetic will be of further help. In two other cases we knew of rather severe reactions from previous attempts with Lipiodol. They tolerated Ioduran B well and there was no side reaction noticed.



FIGURE 5

FIGURE 6

FIGURE 7

Figure 5 is a spotfilm of the left upper lobe, as in roentgenogram (a) of Fig. 4, taken against the fluoroscopic screen.—Figure 6 presents Ioduran B bronchogram of the left lower and lingular portions of the upper lobes in left lateral view.—Figure 7 is a roentgenogram of a young white female with positive sputum for tubercle bacilli and minimal lung disease diagnosed elsewhere. Following the diagnosis and eight months prior to this film, bilateral bronchography with Lipiodol was performed. Postural drainage was used. Chest x-ray films for follow-up of her disease while under treatment at this hospital were of no value because of Lipiodol residual in both lungs.

None of the examined patients showed a spread of disease because of the media used. Three complained of chest pain and increase in amount of expectorations. All complaints disappeared without treatment in a few days.

The Ioduran B contrast on film is slightly different from that of Lipiodol. The latter does not mix with body fluids as water soluble media do. This means that water solubles will bring about better coating of mucosa; therefore, a more complete outline of it. Of course, one could interpret this difference in contrast as unusual for reading of films. Oily media have been in use for several decades and our eyes have become accustomed to them. This should not be an excuse for using oily substances only, especially since so many side effects and organic changes may occur.

As mentioned before, there was no roentgenologically detectable residual noticed, also no postural drainage was used. In one case (Fig. 2) the left side was filled first and films exposed. Thereafter the catheter was removed and the patient asked to expectorate. Six minutes later, the right lung was filled. At this time, roentgenograms showed no detectable Ioduran B in the left lung. Thus bronchograms from both sides may be taken at the same sitting and without the interference of the medium in the opposite side.

Sources of Failure

Anesthesia is the main factor. Instillation in fractions and under the guidance of eyes, placing drop after drop in selected areas will result in good anesthesia. It should take eight to ten minutes to complete it. Pre-medication with sedatives and no Atropine was our choice of procedure. After completion of anesthesia one should test the anesthetized side by passing the catheter in all directions. If areas of sensitivity should be present, additional 1 per cent Xylocaine is instilled. It is of no advantage to add anesthetic agents to the medium, since, in such a case, nothing is to be gained.

All cases with suspected active endobronchial disease, should undergo bronchoscopic examination. When active disease is seen, bronchography should be postponed. A stenotic bronchus will empty Ioduran B without leaving a residual.

An unpleasant condition in the use of Ioduran B is the tendency to ascend along the catheter into the trachea. This can be avoided by proceeding slowly with the injection and positioning of the patient in a manner which will prevent the spilling of the medium to contralateral and unanesthetized side. It should be understood that fluoroscopic guidance is a routine; otherwise, an unequal filling will result.

SUMMARY

1. Fifty-nine tuberculous patients underwent bronchography with water soluble contrast media. Ioduran B was found to be easier to work with and was productive of better contrast pictures than Xumbradil viscous B.
2. There were four Ioduran B cases classified as failures. All were caused by mistakes of management and none because of the medium employed.

3. Five cases of Xumbradil viscous B proved to be total failures. It was felt that with a faster roentgen unit, satisfactory films could be obtained.

4. A wet bronchial tree was found to be advantageous in this series of cases. Rapid emptying with no residual seems to be the main feature of water soluble substances. No side reactions were seen.

5. Water soluble substances mix with body fluids and give more uniform outline of the bronchial tree.

6. Contrast on films using Ioduran B is slightly different from that of oily substances used in bronchography.

7. Success in working with these substances depends on the anesthesia and technique used. There should be no difficulty when Xylocaine is added to another anesthetic agent.

The author wishes to express acknowledgement to Dr. Henry C. Sweany, Chief Medical Director of Florida State Tuberculosis Hospitals, and Dr. Benjamin L. Brock, Medical Director at Central Florida Tuberculosis Hospital for reviewing this article. Appreciation should go to Mr. I. Eric Wood of Tampa, Florida for the photographic work.

RESUMEN

1. Cuarenta y nueve enfermos tuberculosos se sometieron a broncografía con medios de contraste solubles en agua. Se encontró que el Ioduran B facilitó más el trabajo y produjo mejor contraste que el Xumbradil viscoso B.

2. Hubo cuatro casos de Ioduran B considerados como fracasos. Todos fueron causados por errores de manejo y no por medio empleado.

3. Cinco casos de Xumbradil B viscoso fueron fracaso total. Se cree que con una unidad de rayos X más rápida se pueden obtener radiografías satisfactorias.

4. Un árbol bronquial húmedo se encontró satisfactorio en esta serie de casos. Parece que la característica más importante de estas sustancias es el vaciamiento rápido sin dejar residuos. No se observaron efectos colaterales.

5. Las sustancias solubles en agua se mezclan con los líquidos orgánicos y dan un trazo más uniforme del árbol bronquial.

6. Las películas que resultan usando Ioduran B, son ligeramente diferentes de las que se toman usando medios de contraste oleosos.

7. El éxito al trabajar con estas sustancias depende de la anestesia y de la técnica usada. No debe haber dificultad cuando se agrega xilocaína a cualquier otro agente anestésico.

RESUME

1. 59 malades tuberculeux furent soumis à la bronchographie à l'aide d'une substance de contraste soluble dans l'eau. L'Ioduran B" se montra plus facile à manier, et permit de réaliser des clichés mieux contrastés que le "Xumbradil visqueux B."

2. Quatre cas à l'"Ioduran B" furent considérés comme des échecs. Pour tous il fallait invoquer des erreurs d'utilisation et non le produit lui-même.

3. Cinq cas au "Xumbradil visqueux B" se révélèrent des échecs complets. On admit qu'avec un temps de pose plus rapide, on aurait pu obtenir des radiographies satisfaisantes.

4. Un système bronchique humide sembla favoriser les résultats dans cette série de cas. Le nettoyage rapide sans résidu semble être la caractéristique principale des substances solubles dans l'eau. On ne constata aucune réaction secondaire.

5. Les substances solubles dans l'eau se mélangent aux corps fluides et donnent une silhouette plus uniforme de l'arbre bronchique.

6. Le contraste sur les films, pris à l'aide de l'Ioduran B est légèrement différent de celui obtenu à l'aide de substances huileuses utilisées en bronchographie.

7. Le succès de l'emploi de ces produits dépend de l'anesthésie et de la technique utilisée. Il ne devrait y avoir aucune difficulté quand on adjoint la Xylocaïne à un autre produit anesthésique.

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Difficulties in the Diagnosis of Coexistent Bronchogenic Carcinoma and Active Pulmonary Tuberculosis

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In a well documented study of the association of tuberculosis and carcinoma, Cooper stated the tuberculosis is usually a disease of youth, while carcinoma is a disease of old age.¹ However, tuberculosis is now becoming a problem of the older age-group as well and therefore more cases of coexistent pulmonary tuberculosis and bronchogenic carcinoma are being found.

The increasing use of excisional surgery in tuberculosis is contributing to the discovery of many such pulmonary neoplasms which would not otherwise be detected. Among the three cases of active pulmonary tuberculosis presented in this paper, two were proved to have neoplasms by examination of excised tuberculous lung tissue, and in only one of them was it suspected before operation.

Not only has increased diagnostic proficiency caused a rise in reported cases of pulmonary carcinoma, but the absolute incidence of the disease itself has increased tremendously. Once regarded as a pathologic rarity, primary pulmonary malignancy now occupies first place among all types of cancer as a cause of death.² In certain surgical centers, lung neoplasms are reported to be more frequent than those of the stomach.³ Whether this marked increase is due to intensification of the smoking habit or to inhalation of the noxious mixture of gases prevalent in modern industrial cities³ is a problem for further investigation⁴.

With this spectacular increase in the incidence of pulmonary carcinoma and the increased incidence of tuberculosis in the older age-group, the problem of coexistent cancer and tuberculosis of the lung is becoming more important. During 1953, Drs. Hupert, Mendes, and our group have observed three cases of this type.

Case 1: A 48 year old married Polish-born watchmaker immigrated to Israel in 1933. The family and past history were non-contributory. In 1950, at routine fluoroscopy for army induction, the diagnosis of tuberculosis of the right lung was made. In the same year he was hospitalized and treated with para-aminosalicylic acid for one month with slight improvement in his condition. Streptomycin injections were discontinued after a few days when jaundice developed. Because of onset of mental depression and attempted suicide he was transferred to a hospital for mental diseases where he received electroshock therapy and was then discharged.

He was later admitted to a general hospital because of deterioration in his general condition, but in December 1951, due to recurrence of mental depression he was again sent to a hospital for mental diseases. There, following treatment with streptomycin, PAS and electroshock, his condition improved considerably.

In January 1952, he was readmitted and found in poor nutritional state. The temperature was normal, sedimentation rate (Westergren) was 65 mm. in the first hour,

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*In Israel we still observe twice as many neoplasms of the stomach as those of the lung. Perhaps this is because our air is not yet as polluted as that of the large European and American cities.

and acid-fast bacilli were found in the sputum. X-ray film of the chest showed a fibrotic lesion with cavitation in the right apex and fibrotic changes in the left apical region. Another course of streptomycin (20 gm.) and PAS (1175 gm.) was administered. In March 1952, right pneumothorax was induced, but discontinued after three months because it was ineffective. Following a course of nicotibine (30 gm.), there was slight improvement, and the sedimentation rate fell to 21 mm. in one hour. Five sputum cultures were negative for tubercle bacilli. The cavity in the right apex had become smaller but in the right central lung field a round lesion, which appeared to be a tuberculoma or an abscess, had developed (Figs. 1 and 2).

Bronchoscopy (August 3, 1953) showed excess secretion from the right main bronchus and upper and lower lobe bronchi, and slight swelling and redness of the mucosa of the right upper lobe bronchus.

On October 8, Dr. C. Milwidski performed a right upper and middle lobectomy. Following the discovery of anaplastic and squamous cell carcinoma and tuberculosis on histological examination, it was decided to explore the mediastinum for metastases. A mediastinal mass was found, the removal of which would have involved excision of the right lower lobe. This could not be carried out since clamping of the lower lobe bronchus resulted in cyanosis and a rise in blood pressure.

He was treated with deep x-ray therapy, but severe chest pain developed. He has recently begun to have headache suggesting the possibility of brain metastases.

Pathology report: The specimen consisted of a right upper and middle lobe, 4.5 x 12 x 12 cm. The visceral pleura was thickened and covered with a number of fibrous strands and clotted blood. In the apex there was an area of caseation with irregular borders. The dense, fibrotic pleura overlying this was 1 cm. in thickness. The surrounding lung tissue was fibrotic, blackened and contained a number of small, round caseous lesions. The center of the middle lobe was occupied by a round, irregular mass, 6 cm. in diameter composed of nodular, moderately hard, yellow-grey tissue. This mass was well delineated and contained scattered foci of necrosis. The rest of the lung parenchyma appeared more or less normal except for some dilatation of the alveoli. The hilar region contained some firm, enlarged lymph nodes composed of blackened, fibrous tissue and small areas of caseation.

Histology: Anaplastic carcinoma of the right lung with areas of squamous cell carcinoma. Fibro-caseous tuberculosis in the apex of right lung. No evidence of tuberculosis or neoplasm in the lymph nodes.

Comment: The difficulty in the roentgenological differentiation between tuberculous cavity and lung abscess is illustrated by this case. This point is stressed because a third of all lung abscesses in people over the age of 45 are due to underlying carcinoma.⁸

Case 2: A 56 year old Polish-born man immigrated to Israel in 1950. The family history was non-contributory. Early in 1952 he began to cough and to lose weight. During

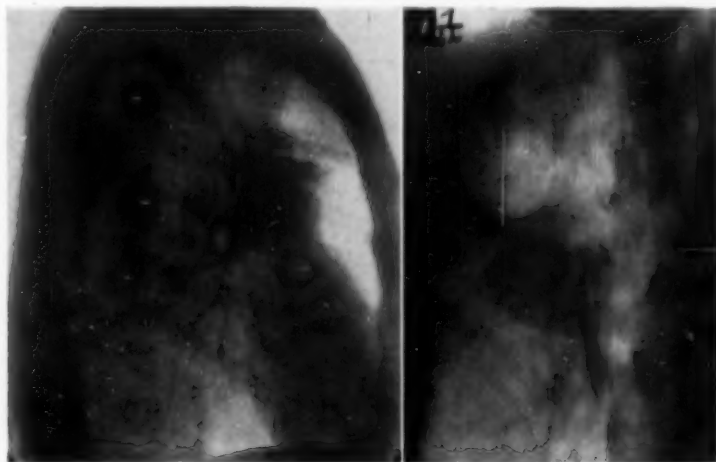


FIGURE 1

FIGURE 2

Figure 1 (CASE 1). Right Lateral View. Round mass in right central lung field showing eccentric cavitation.—Figure 2 (CASE 1). AP tomogram, plane 11.5 cm. Fibro-productive tuberculosis of the right apex. Mass in right central lung field.

the latter part of 1953 there was an increase in the amount of sputum. Low grade fever developed, and there were repeated bouts of hemoptysis. Physical examination revealed only slight dullness in the left intracavicular region.

X-ray film showed a dense shadow in that region extending downward and medially to the hilum. Cavities with fluid levels were present in this shadow (Figs. 3 and 4). Acid-fast bacilli were found in the sputum. After treatment with 13 gm. of nicotibine and 840 gm. of PAS, the sputum became negative on repeated examination, except for one occasion when a positive culture was obtained (February 5, 1953).

Despite the finding of tuberculosis, malignancy was suspected and bronchoscopy was performed. The left main bronchus was edematous and malignant cells were present in the aspirated secretions.

The left lung was resected and showed both bronchogenic carcinoma and tuberculosis. Several months after operation left hemiplegia due to brain metastasis developed. He left the hospital against advice and further information became unavailable.

Pathology report: The specimen consisted of a left lung measuring 23 x 16 x 7 cm. Several fibrous bands were scattered over the pleural surface. The apical segment and portions of the anterior segment of the upper lobe were of a firm consistency and sections through these areas revealed atelectasis. The anterior segment contained a round cavity 1 cm. in diameter, which communicated with the corresponding bronchus. In the lung tissue surrounding the cavity as well as in the whole lower lobe were scattered small encapsulated caseous foci and solitary and confluent tubercles. Between the main bronchus and that of the anterior segment of the upper lobe, there was a dense, homogeneous greyish white mass, which seemed to penetrate both into the surrounding lung tissue and into the thickened bronchial wall.

The microscopic examination of the sections obtained from various areas showed granulation tissue suggesting tuberculosis and caseous pneumonia. Sections taken from the dense mass described above revealed bronchogenic carcinoma. Tumor cells spreading along the peribronchial lymphatics reached up to the walls of the cavity. Metastases were found in two perihilar lymph nodes examined.

Comment: This case was diagnosed by means of bronchoscopy and the examination of the aspirated secretions for malignant cells. The latter method is of increasing usefulness in the diagnosis of pulmonary carcinoma.

Case 3: A 27 year old Polish-born male, who was interned in a concentration camp during the second world war, immigrated to Israel in 1950. In 1947 the diagnosis of pulmonary tuberculosis with cavitation in the left lower lobe was made. Artificial pneumothorax was induced and continued to the end of 1951 when it was gradually discontinued.

In March 1952 tubercle bacilli were found in the sputum and x-ray films revealed atelectasis of the right middle lobe. When hospitalized in June 1952, x-ray film showed a dense right middle lobe (Fig. 5). Repeated sputum examinations were all positive for tubercle bacilli.

Bronchoscopy revealed no abnormality. The orifice of the right middle lobe bronchus was patent and appeared normal. In view of the rapid sedimentation rate (32 during

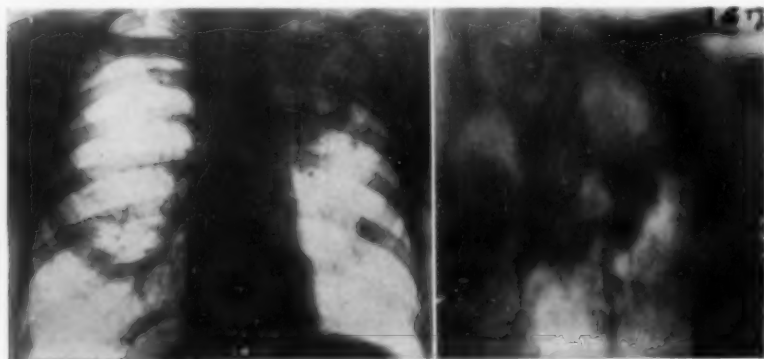


FIGURE 3

FIGURE 4

Figure 3 (CASE 2). AP showing cavities with fluid level in left intracavicular region. —Figure 4 (CASE 2). AP tomogram, plane 12.5 cm. Cavities with fluid levels in left intracavicular region.

the first hour) it was decided to postpone surgery until stabilization of the tuberculous state.

In December 1952 there was a sudden rise in temperature accompanied by severe non-productive cough. The shadow in the middle lobe had become larger and an interlobar effusion was suspected. A number of densities were also seen in the right lower lobe. The stubborn nature of the cough drew attention to the possibility of perforation of a lymph node into a bronchus. Despite the fact that the fever subsided within nine days, intensive chemotherapy with nicotibine and PAS was continued.

All sputum cultures were negative for tubercle bacilli after January 1953. Following stabilization of the tuberculous process, excision of the right middle and lower lobe was performed by Dr. Langer on May 25, 1953. Histological examination of the resected portions revealed unsuspected carcinoma of the middle lobe, as well as tuberculosis of the apical segment of the lower lobe. Complete right pneumonectomy was not advisable in view of the likelihood of decreased function of the left lung as a result of previous artificial pneumothorax. Irradiation was contraindicated by the possibility of precipitating tuberculous meningitis. He was therefore treated conservatively with rest. At present he is in excellent general condition, shows no sign of metastases, and expects to return to work soon.

Comment: This case is unusual because of the comparative youth of the subject (27 years) as well as the uncommon site of the neoplasm. Of 1,200 cases of lung carcinoma collected by Brock⁹ only eight were found in the middle lobe.

Discussion

The first reports of coexisting pulmonary tuberculosis and cancer were by Bayle in 1890¹⁰ and Penard in 1846.¹¹ However, Rokitsansky claimed that antagonism prevails between tuberculosis and carcinoma.¹² Much statistical data concerning the problem of the association of these two diseases has since been collected, but has not supported Rokitsansky's view.¹ Furthermore, most of the experimental studies also indicate that there is no antagonism between the two diseases.¹ In addition, there is a



FIGURE (CASE 3). Right lateral tomogram, plane 10 cm. At the apex of lower lobe a small cavity. Atelectasis of middle lobe.

growing conviction that the frequent association of cancer and tuberculosis of the lung is not just coincidental, but that there may even be a causal relationship between them. Carcinoma as a debilitating disease lowers the resistance to tuberculosis and may result in the activation of latent tuberculosis.

Kayne, Pagel and O'Shaughnessy¹³ describe cancer developing in old tuberculous cavities, as well as cancer nodules in the lung surrounded by recent tuberculous foci. Pagel¹³ also found tubercles lying within malignant lung tissues. If there is a causal relationship between these processes, it may be only secondary in character, and depend on such factors as chronic irritation or metaplasia of epithelial tissue associated with an old tuberculous cavity. The debility produced by cancer, or its interference with the pulmonary blood flow, may be the mechanism for activating latent tuberculosis.

It has been suggested that tuberculosis is the main etiological factor in the development of pulmonary carcinoma. However, as pointed out by Neussle,⁵ since tuberculosis is usually peripheral in location, and bronchogenic carcinoma central, the first can not often be a factor in the production of the second. Still bronchial tuberculosis centrally located in the main lobar or segmental bronchi is certainly not infrequent.

The incidence of bronchogenic carcinoma in autopsied cases of active pulmonary tuberculosis is about 1.4 per cent.⁵ Therefore, among the estimated 400,000 cases of pulmonary tuberculosis in the United States¹⁴ there may be as many as 6,000 cases of coexistent cancer and tuberculosis of the lungs waiting to be discovered. Phthisiologists must therefore become more "cancer minded" and always consider the possibility of the coexistence of the two diseases. The often difficult differential diagnosis between cancer and tuberculosis is further complicated by the frequent necessity of diagnosing each disease in the presence of the other. Severe pain associated with wheezing, but without signs of pleural complications, should awaken suspicion of bronchogenic carcinoma. Tuberculous bronchitis causes wheezing but is rarely accompanied by pain. Atelectasis is more frequently found in cases of cancer than of tuberculosis.

Hemoptysis, when due to tuberculosis, is often well controlled by streptomycin. Carcinoma, on the other hand, causes hemoptysis more frequently than does tuberculosis, but when hemoptysis is due to carcinoma, streptomycin is of course without preventive effect.

SUMMARY AND CONCLUSIONS

1. The incidence of cancer of the lung has been increasing rapidly, and its association with active pulmonary tuberculosis has therefore become more frequent.
2. Three cases of coexistent pulmonary tuberculosis and cancer are presented, including one in a man only 27 years old.
3. Atelectasis, or severe pain in the absence of pleural complications, accompanied by wheezing and hemoptysis, occurs more frequently in cancer of the lung than in tuberculosis.
4. Early bronchoscopy with repeated cytological examination of the

aspirated material may help to detect coexisting carcinoma in cases of pulmonary tuberculosis.

RESUMEN Y CONCLUSIONES

1. La frecuencia del cáncer del pulmón ha venido aumentando y su asociación con la tuberculosis por tanto, se ha hecho también más frecuente.

2. Se presentan tres casos de coexistencia de tuberculosis y cáncer incluyéndose un hombre de 27 años.

3. La atelectasia o el dolor intenso en ausencia de complicaciones pleurales, acompañada de silbidos y hemoptisis, ocurre más a menudo en el cáncer que en tuberculosis.

4. La broncoscopia temprana con exámenes citológicos repetidos del material aspirado, puede ayudar para descubrir el carcinoma coexistente con tuberculosis pulmonar.

RESUME

1. La fréquence du cancer pulmonaire s'est rapidement accrue et par suite son association à une tuberculose pulmonaire active est devenue moins rare.

2. L'auteur présente trois cas de coexistence de tuberculose pulmonaire et de cancer. L'un d'entre eux concerne un homme de 27 ans.

3. L'atélectasie, la violente douleur en l'absence de complications pleurales, associées à un wheezing et à des hémoptysies, sont plus fréquentes dans le cancer du poumon que dans la tuberculose.

4. Une bronchoscopie précoce avec examen cytologique répété des produits d'aspiration peut aider à découvrir un cancer associé dans beaucoup de cas de tuberculose pulmonaire.

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Stimulating Opportunities for Research in Diseases of the Chest*

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It is with great temerity that I shall attempt to discuss the topic which has been assigned to me, for many of you could present it with greater clarity and authority. It is only the realization of the great debt that we as physicians owe to our colleagues and predecessors who have advanced the knowledge of medicine through research that encourages me to undertake the present task. The term "research" may mean many things to different men. Webster defines research as a studious inquiry, usually with critical and exhaustive investigation and experimentation, having for its aim the revision of accepted conclusions in the light of newly discovered facts. To most of us it simply means "the search for truth."

It is well to note that we live in an age of science, in fact, of adventure and science—an age when science is about to outstrip all other activities. We are fortunate indeed to be offered the privilege of joining in its pursuit. The search for truth is not granted with equal opportunity to physicians throughout the world. We in America live in a land and in a time of opportunity that we often appreciate all too little. We live in a land in which the medical profession is allowed and encouraged to investigate the unknown and bring to fruition the betterment of man, I would therefore begin with a note of gratitude and a hope that we may continue to deserve and cherish the privilege accorded us to attain these ends.

Each generation has a tendency to look with envy on the generation that has just passed as having lived in a period when opportunity was most abundant and success most easy to achieve. As a young man entering the medical arena at the end of World War I, it seemed discouraging to try to improve on the knowledge possessed by such giants of medicine and surgery as Osler, Virchow, Mayo, Pasteur and their illustrious confreres. Still, the 30 years that have elapsed since have brought forth advances in medicine and surgery that stagger the imagination. To this period the term "The Golden Age of Medicine" has justly been assigned. One need but recall the discovery of the antibiotics and chemotherapeutic agents which have conquered, in large measure, the infectious diseases, subjugated pulmonary tuberculosis and conquered syphilis, the scourge of man, to realize the truth of such a designation. The hope and courage that have been offered patients with diabetes, pernicious anemia and endocrine disorders by the contributions of investigators

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of the past decade are immeasurable. Many secrets of the heart, lungs and central nervous system which seemed bound in mystery have been successfully probed and dealt with.

Are we, then, faced with the prospect that there is nothing further to learn, and that the opportunities for research are limited? If we adopt only the opinions and thoughts of our forebears and contemporaries, we will indeed create or develop nothing new. Medicine, fortunately, is both a dynamic science and a vital art, and therefore cannot and must not rest on present laurels. It was Huxley who, in his address on education, so succinctly stated, "The rung of a ladder was not meant to rest upon, but only to hold a man's foot long enough to enable him to put the other somewhat higher." Having attained the position that has been described by many as the golden age of medicine, we must not become complacent and self-satisfied. We must and shall retain the resiliency of youth and continue the search for knowledge. Knowledge does not come easily but is the product of great labor and great sacrifice. It is only through the advance of ideas that progress is ultimately determined. It is important that we manifest a refreshing vigor for work and a persistent impatience with the unknown if we are to obtain the greatest satisfaction of all: to help the sick, be it either in body or in soul. Man's greatest delight and satisfaction is in the production of something new: an idea, an ideal, or life itself. The medical profession and the world in general have come to appreciate the importance and significance of new ideas and new truths, and have seen fit to honor the investigator and searcher for truth in a manner he justly deserves. The researcher today occupies a place of special importance in the field of medicine.

Never in the history of man have those within the medical profession, and those without it, had a greater incentive to advance the frontiers of knowledge. The vista that presents itself to the searcher after truth is indeed a most inviting one. Today the investigator no longer must suffer the economic slavery of our forebears, for industry and our nation as a whole have come to realize the tremendous worth of those who probe the unknown. The American College of Chest Physicians takes special pride in encouraging those who have the urge and possess the traits of the investigator by moral stimulation and the sincere hope that ere long it may give financial assistance as well. The College has always accorded the investigator a place of great importance in the formation of its scientific programs.

The period ahead presents a most intriguing challenge and opportunity for research in the field of cardiorespiratory disease. The timid individual, who may fear that there is little new to explore, need only listen to the splendid papers that are being presented to us today to realize that we are but on the threshold of a period that may surpass in accomplishment that just passed. The present period has been ushered in by advances in the field of cardiac disease that have given mankind much encouragement. The advances being made in the field of pulmonary physiology are but a beginning of what lies ahead. The role of the endocrine glands

and the enzymes in the aging process of man as it involves the heart and lungs has hardly been touched upon and cries for clarification. The veil on the mysteries of cancer of the lung has been lifted but slightly and the problem is waiting for the investigator to reveal its secrets. With such a revelation will come the cure of one of man's greatest afflictions. Viral and fungous infections and their relationship to respiratory disease become of increasing importance with the ease of international travel. Industrial diseases as they affect the heart and lungs present an increasing challenge to the investigator. It is obvious that the opportunities for research, both clinical and laboratory, in cardiorespiratory disease are unlimited.

Time has demonstrated that it is not possible to predict when, where and by what individual a new thought will be evolved or a discovery made. Often the individual cluttered with too much information concerning the impossibilities of a situation is less likely to discover a solution than the one unaware of such discouraging factors. The well-informed investigator who possesses some knowledge of the literature pertaining to a given problem is more likely to be successful than the uninformed. It is not given to all men to discover something new, but the rediscovery of an old truth or fact can often be as significant or as important as the original presentation. One need but direct attention to the reintroduction of the drugs being used presently in the treatment of hypertension and the use of curare in the field of anesthesiology.

No discovery, even though of world-shattering significance, has the least value unless the information concerning the discovery is transmitted to others. It is the duty of the physician who has learned something new, or produced what was unknown before, either in research or from his own clinical or surgical experience, to publish this information clearly and concisely. Great care should always be exercised to review the literature pertaining to the problem, for nothing causes greater humiliation than to report a discovery as being original, only to find later that it has been reported previously by another. What is well written in a modest manner will receive greater attention than what is presented in a dry, uninteresting and verbose manner.

The opportunities for research in the field of pulmonary and cardiac disease are indeed most enticing. Research especially affords the physician a real opportunity to capture the pleasures of pure delight which are so essential in the development of medicine, and, by such delight, to improve the lot of mankind.

Case Report Section

Fatal Hypersensitivity to PAS and Streptomycin

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The common toxic effects of para-aminosalicylic acid (PAS) and streptomycin, i.e. gastrointestinal upset and auditory nerve damage respectively, are familiar to all. Hypersensitivity reactions to either drug, however, are relatively uncommon. They may be protean, but are generally recognized by the onset of fever or rash. The following case appears to be the first reported fatality in this country due to a hypersensitivity reaction to either PAS or streptomycin.

Case History

A 22 year old Negro airman was admitted to Letterman Army Hospital on April 22, 1952. Personal and family history were negative for allergic disease. He was found to have tuberculosis, with extensive left pulmonary infiltrations, left pleural effusion, pericardial effusion, palpable spleen, cervical adenopathy, and persistent fever of 101° to 104° F. Therapy with 3.0 Gm. of PAS orally four times daily was begun on May 19 and with 1.0 Gm. of streptomycin intramuscularly every third day on May 20. The patient's temperature declined and his appetite improved.

On June 3 high fever recurred. He developed a pruritic maculopapular eruption on the forehead on June 6, which within three days spread to involve the entire body excluding the palms and soles. Review of his temperature record revealed that a rise had occurred every third day from May 26 to June 7, shortly after each injection of streptomycin. This was believed to be the offending drug and was discontinued. Severe conjunctivitis, increased lymphadenopathy, anorexia, and hacking cough developed, and his temperature rose to 105° F. On June 9, administration of PAS was discontinued and treatment with 400 to 600 mg. of pyribenzamine daily was started. The roentgenogram on June 10 showed decrease in the pericardial and left pleural effusions, but increase in the parenchymal densities. The leukocyte count was 12,200, without eosinophilia. The urine contained numerous granular and hyaline casts but was otherwise normal. On June 12, he became delusional, describing in great detail seeing insects at the window, hearing them buzz about, and feeling them bite. He became agitated and required restraints. By June 15 the fever had remained below 101° F. for 96 hours, and the adenopathy and rash had decreased. Spinal fluid was normal.

PAS was reinstituted on June 16 in the dosage of 3 Gm. four times daily. His temperature rose to 104° F. accompanied by stupor and a mild exacerbation of the skin eruption. Three hundred thousand units of aqueous procaine penicillin were given daily on June 17, 18, and 19. One Gm. of dihydrostreptomycin was given intramuscularly on June 19. Three hours later he began to scratch his extremities and genitalia. All medication was discontinued. On June 20 he began to vomit. A right pleural friction rub was heard. The leukocyte count was 7,300. Differential smear showed 28 per cent segmented neutrophils, 10 per cent non-segmented neutrophils, 23 per cent eosinophiles, 2 per cent basophiles, 32 per cent lymphocytes, several of which were "atypical," 3 per cent monocytes, and 2 per cent plasma cells. There were 2 nucleated erythrocytes per 100 leukocytes. The hematocrit was 41 per cent. The serum chlorides, carbon dioxide combining power, sodium, and potassium were normal. At 6 o'clock the following morning the patient had a grand mal convulsion and died.

At necropsy three hours later the sclerae were noted to be icteric. Gross and microscopic evidence of tuberculosis was found in the lungs, pericardium, and spleen, and the cervical, hilar, and mesenteric lymph nodes. The liver was uniformly mottled yellow-brown and weighed 1750 Gm. Microscopic examination revealed widespread necrosis often involving entire lobules, but usually sparing some atrophic and degenerating or enlarged and binucleated parenchymal cells near the portal areas. The

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stroma enmeshed primarily red blood cells and acute and chronic inflammatory cells, some with golden brown pigment. There was moderate bile duct proliferation. The kidneys showed evidence of a chronic pyelonephritis. The brain was congested and edematous but without evidence of tuberculosis.

Discussion

Sensitivity reactions to PAS usually begin 10 to 40 days after the institution of PAS therapy. Approximately 65 cases have been reported in the American and British literature.¹ Fever was the most common finding, characterizing over 90 per cent of the reactions. Skin eruptions, usually maculopapular or scarlatiniform occurred in 80 per cent of the cases. Eosinophilia was found nearly always when the differential smear was reported. Lymphadenopathy was commented on 30 per cent of the time, frequently accompanied by a blood picture resembling that found in infectious mononucleosis. Jaundice occurred in 20 per cent of the cases. Conjunctivitis or excessive lacrimation was seen in 14 cases; asthma, pulmonary infiltrations, or a hacking cough in 6 cases; albuminuria, hematuria, or azotemia in 5 cases; and striking central nervous system changes, sometimes mimicking tuberculous meningitis, in 4 cases.

Sensitivity to streptomycin or dihydrostreptomycin is characterized chiefly by fever, dermatitis, and eosinophilia, and occurs especially in individuals handling the drugs.² Liver damage has not been reported, except in patients with concomitant PAS sensitivity.³

In our patient, the first definite sign of sensitivity, a pruritic maculopapular rash, occurred on the 18th day of PAS therapy. Increase in fever had preceded this by 3 days. Conjunctivitis, lymphadenopathy, cough, severe mental disturbances, atypical lymphocytosis, and eosinophilia followed. Jaundice was not apparent until death. Autopsy revealed widespread tuberculosis, but death was due to an acute hepatic necrosis and cerebral edema. These symptoms and findings are strikingly similar to those found in PAS sensitivity and exceed those reported due to streptomycin sensitivity alone. A similar hepatic necrosis was seen by Muri of Scandinavia in his case of fatal PAS sensitivity.⁴

The prompt exacerbation following reinstitution of PAS incriminates this drug. The temperature peaks at 3 day intervals coincident with the injections of streptomycin from May 26 to June 7, and the further exacerbation of the rash on June 20 after the injection of dihydrostreptomycin incriminates these drugs as additional sensitizing agents.

It may be difficult to differentiate a sensitivity reaction to drugs from the deterioration due to spread of the tuberculosis. Both may occur simultaneously. Treatment of the former includes discontinuing the offending drug or drugs promptly, whereas dissemination of the tuberculosis would make continued chemotherapy mandatory. Gradual desensitization to PAS is often successful.

SUMMARY

1. A hypersensitivity reaction to PAS and streptomycin is reported, believed to be the first fatal case in this country.
2. The reaction was characterized by fever, skin rash, conjunctivitis,

lymphadenopathy, mental deterioration, eosinophilia, atypical lymphocytosis, and a fulminant hepatic necrosis.

3. Both PAS and streptomycin appeared to be sensitizing agents.

RESUMEN

1. Se relata una hipersensibilidad al PAS y a la estreptomicina creyéndose que es el primer caso fatal relatado en el País.

2. La reacción se caracterizó por fiebre, erupción cutánea, conjuntivitis, linfadenopatía, deterioro mental, eosinofilia, lifocitosis atípica, y necrosis hepática fulminante.

3. Tanto el PAS como la estreptomicina parecieron ser agentes sensibilizantes.

RESUME

1. L'auteur rapporte une réaction d'hypersensibilité au P.A.S. et à la streptomycine, qu'il croit être le premier cas mortel rapporté dans son pays.

2. La réaction fut caractérisée par de la fièvre, une éruption cutanée, une conjonctivite, des adénopathies, des troubles mentaux, une éosinophilie, une lymphocytose atypique et une nécrose hépatique suraigue.

3. Le P.A.S. et la streptomycine semblent être tous les deux des agents sensibilisants.

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Sarcoidosis: Improvement in Chest X-ray Shadows During Pregnancy

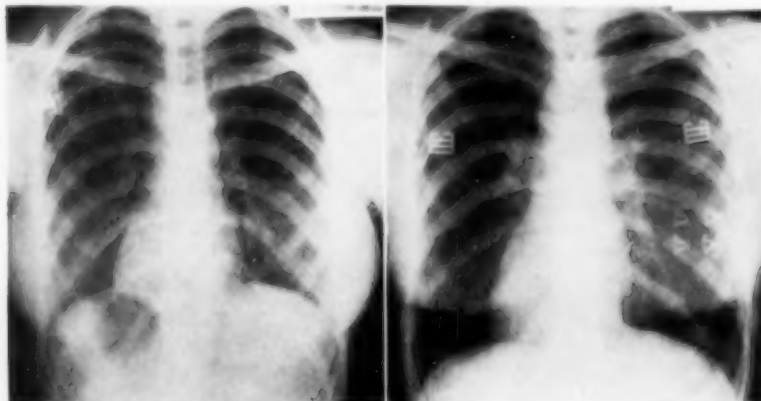
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Despite the great mass of literature on the subject of sarcoidosis, little is actually known about the exact nature of the disease. It therefore seems important to add any data which appears to be new so that sometime it may be possible to assemble the whole picture.

This case is that of a young woman who was diagnosed sarcoidosis in the early months of her second pregnancy. The pulmonary manifestations (as shown) on the x-ray film revealed progressive improvement until the time of delivery, only to regress following this back to the original state.

In contrast to the topic in general, the literature concerning sarcoidosis and pregnancy is scanty. Aykan and Juskowitz¹ reviewed the English literature from 1940 to 1951 and found a single reference to the subject. They reported two cases of their own and noted no definite effect of pregnancy on sarcoidosis. Russell² reported a case in 1951 with improvement in the chest x-ray shadows during pregnancy and with continuing improvement post-partum. He considered this to be incidental and not due to any beneficial effect of pregnancy. Donaldson et al.³ in 1951 reported three cases and concluded that pregnancy did not significantly alter the course of the sarcoidosis in any instance. Also in 1951, Berman⁴ reported a case benefited by pregnancy. The beneficial changes were noted in the general clinical state, the size of the enlarged spleen and in the albumen/globulin ratio. However, no change in the chest x-ray shadows occurred. In 1953, Gallaher and Douglass⁵ reported two cases of pregnancy with associated sarcoidosis but no beneficial or other effect of one condition on the other was noted. Our patient came to attention in February, 1953, as the result of a routine pre-natal x-ray film inspection. She was 22 years old and was four and one-half months pregnant. There was no chest complaint. The chest x-ray film showed an increase in the hilar shadows and some bilateral parenchymal infiltration. The tuberculin patch test was slightly positive. No sputum was present but gastric washings were obtained and were negative for tubercle bacilli on culture. An x-ray film background was present with negative 4 by 5 films in 1947 and 1949 as part of routine surveys at place of



Normal x-ray, 1949.

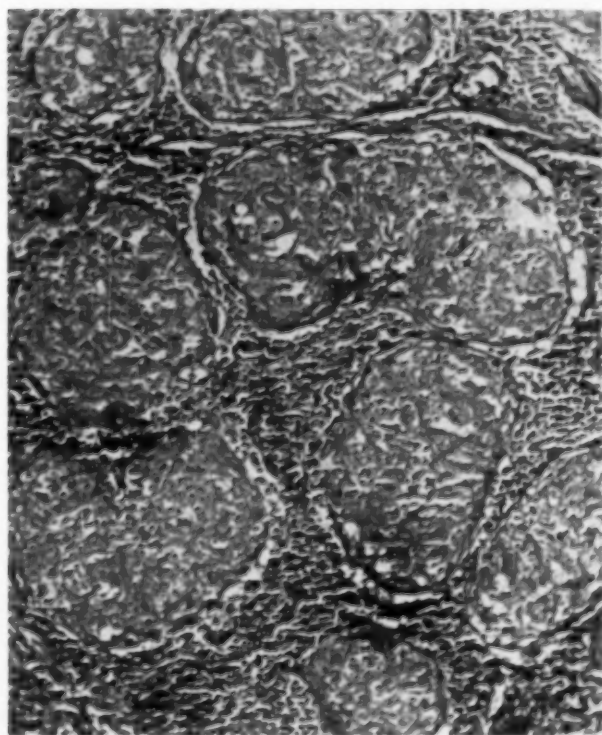
February, 1953—4½ months pregnant.

Halifax Tuberculosis Hospital.



July, 1953—at term.

Post-partum



Histology—biopsied lymph node.

employment. Unfortunately, no chest x-ray film was done when her first child was born in 1950. There was no known exposure to tuberculosis. No occupational hazard had been encountered. Except for a left inguinal herniorrhaphy in 1948, her previous health had been excellent. In the family history, the father once had peptic ulcer, the mother had suffered from asthma and a grandmother had diabetes mellitus.

The abnormal miniature x-ray film was repeated and, being still abnormal, a large x-ray film was done on March 2. The shadows were unchanged as was true of another film a month later. The film on May 1 showed some improvement and this was continued on June 6 and July 7. She was delivered of a normal healthy male child on July 22, and while in hospital, the routine screening x-ray film was essentially normal.

The follow-up post-natal x-ray films showed a progressive return of the previous abnormalities. This may be seen on the films of September and December, 1953, and January, March, April, August and November, 1954.

From the clinical standpoint, the record of symptoms is of little note, there being only a slight amount of dyspnea and this just recently. The general health has been excellent. Moderate splenomegaly has been noted since February, 1954, and this seems to be getting more prominent. At the time of the most recent examination in November, 1954, it was a full hand's breadth below the left costal margin. A few small cervical and axillary lymph nodes have been palpated. Pulse and temperature have been normal throughout.

Laboratory findings:

Hemogram revealed no abnormality.

Blood chemistry was normal.

Plasma proteins: Date—April, 1953, Albumen 4.1 gm. per cent; Globulin 3.1 gm. per cent

Plasma proteins: Date—March, 1954, Albumen 3.7 gm. per cent; Globulin 2.9 gm. per cent

Blood Wassermann and long bones of hands were negative.

Anterior Scalene fat pad biopsy done in March, 1954, showed a lymph node with histologic characteristics of sarcoidosis.

SUMMARY

The preceding case was diagnosed as sarcoidosis on the basis of the abnormal roentgenogram and the histologic appearance of a biopsied lymph node along with the clinical findings of enlarged spleen and lymph nodes. The radiologic lesions showed marked regression during the latter months of pregnancy so that they had virtually completely disappeared at the time of delivery. Post-partum the x-ray shadows reverted back to the previous abnormal state.

In view of the paucity of case reports it will be necessary to record much more data before it may be possible to ascertain whether changes such as noted above are incidental to the course of the disease or whether they may be due to some physiological alteration in the body state during pregnancy.

RESUMEN

El caso que precede fué diagnosticado como de sarcoidosis en vista de la radiografía anormal y la apariencia histológica de un ganglio, así como los hallazgos clínicos correspondientes a esplenomegalia y ganglios crecidos. Las lesiones radiológicas mostraron notable regresión durante los meses siguientes del embarazo de modo que virtualmente desaparecieron al tiempo del parto. Después del parto, las manchas radiológicas volvieron a la situación anormal previa.

En vista de la escasez de historias clínicas, sería necesario reunir más información aún antes de poder asentar si los cambios como los descritos son sólo incidentales en el curso de la enfermedad y pueden ser debidos a alguna alteración fisiológica durante el embarazo.

RESUME

Dans le cas rapporté, une radiographie anormale, l'aspect histologique d'une biopsie ganglionnaire, l'augmentation de volume de la rate et des ganglions permirent le diagnostic de sarcoidose.

Les lésions radiologiques montrèrent une régression marquée pendant les derniers mois de la grossesse, si bien qu'elles avaient virtuellement disparu au moment de l'accouchement. Après l'accouchement, les ombres radiologiques reprirent leur aspect anormal antérieur.

Etant donné le peu de cas publiés, il est indispensable de rassembler beaucoup plus de faits avant de pouvoir déterminer si les modifications enregistrées appartiennent à l'évolution de l'affection ou si elles sont attribuables à quelque altération physiologique de l'organisme pendant la grossesse.

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Report of a Case of Miliary Tuberculosis and Tuberculous Meningitis Treated with Isoniazid

KATHRYN B. SCHWERMA, M.D. and PAUL J. LAWRENCE, M.D.

Madison, Wisconsin

This report is intended to show the effect of prolonged treatment with isoniazid in a case of miliary tuberculosis and tuberculous meningitis. Its presentation at this time, more than two years since isoniazid has become a widely accepted anti-tuberculous drug, seems to us to be justified by the scarcity of reports in the medical literature of this country of its use as the sole chemotherapeutic agent in the treatment of miliary and meningeal tuberculosis, and by the long period of observation following the arrest of active disease in this patient. In 1952 Clark et al¹ described their results with a small series of cases which led them to infer that isoniazid was equal or superior to streptomycin in its anti-tuberculous activity. At Municipal Contagious Disease Hospital in Chicago seven of 13 patients with meningitis treated with isoniazid alone survived for six months or more. These results were considered by the authors of this report² to have been as good as those obtained with isoniazid plus streptomycin. From the journals of foreign countries have come additional evidences of the ef-

¹Lake View Sanatorium.

fectiveness of isoniazid. A report from England³ described seven patients with meningitis all alive and well six to twelve months after a sixteen-week course of isoniazid. Similar articles have appeared in France,⁴ Portugal,⁵ and elsewhere. We now add our observations of a woman treated with isoniazid alone (except for an initial four-week period of streptomycin and para-aminosalicylic acid) and followed for more than two years, through pregnancy and childbirth.

This 19-year-old housewife of Scandinavian descent, was transferred to the county sanatorium from a general hospital on April 5, 1952. Her condition had been diagnosed three weeks before the transfer as miliary tuberculosis. Investigation revealed that her Mantoux test had been negative while she was in grade school and that her photofluorograms had been negative while she was in high school. During the year prior to the clinical onset of the disease she had been working in an office with a person who was later found to have far advanced pulmonary tuberculosis, but there had been no indication of her own ill health until the time that vomiting of pregnancy had its onset in October, 1951. During the next three months vomiting and nausea became moderately severe and she suffered weight loss of approximately 10 pounds. On March 15, 1952, after a two-month period of apparent improvement, she developed fever of 104°. She was hospitalized immediately and rapidly developed severe dyspnea and cyanosis as part of what appeared to be a terminal condition. Examination revealed that the liver and spleen were tender and slightly enlarged. She had a red blood count of 2,500,000 cells per cubic mm. and 7 grams of hemoglobin per 100 cm. Oxygen inhalation and blood transfusions were administered. On March 17 her temperature reached 105°; a chest x-ray film then showed miliary pulmonary lesions. She was immediately placed on 2 grams of streptomycin intramuscularly daily (later reduced to 1 gram), and para-aminosalicylic acid, 10 grams orally. The next day she delivered spontaneously a five-month fetus.

When she entered the sanatorium two weeks later (April 5, 1952) she weighed only 90 pounds (20 pounds below her normal weight), had a pronounced pallor, cyanosis of the nail beds, oral temperature of 102°, and slight nuchal rigidity. Lumbar puncture done on April 7 yielded fluid which was positive on culture for tubercle bacilli and contained 16 white cells per cubic mm.

After six days in the sanatorium she suddenly developed a variety of mental and neurological symptoms which indicated tuberculous involvement of the meninges and the cerebral cortex. She was apathetic, unable to communicate, confused, and in poor contact. There was no evidence of disturbed function of the cranial nerves. Motor function was hard to test because of her inability to cooperate and general debility. Reflexes in the upper extremities were hyperactive with ankle clonus more marked on the right side.

Ophthalmological examination revealed small whitish choroidal lesions scattered about both fundi, especially near the discs and maculae. These were conglomerate and were raised slightly. There was no pigment disturbance as yet; the lesions had a fluffy active appearance and the borders were slightly indistinct. Our diagnostic impression was acute chorio-retinitis (OU), with characteristic miliary tubercles.

In spite of the increased mental symptoms, the miliary pulmonary lesions showed x-ray evidence of having begun to clear since the advent of the streptomycin and para-aminosalicylic acid treatment. However, the streptomycin and para-aminosalicylic acid were discontinued on advice (April 15, 1952, after a treatment period of 30 days) and she was placed on a schedule of isoniazid, 100 mg. three times daily. Four days later her temperature dropped from a peak of 102° to 100° daily.

Within two weeks she was much more alert, with the sensorium clearer, and contact complete. She exhibited no disorientation, and there was no sign of aphasic disturbances. Reflexes were generally unchanged except that Hoffman's sign was positive and there was no clonus.

By June 6 the choroidal lesions had lost their fluffy active appearance, and although pigmentation remained the same they had subsided noticeably. On June 20 it was observed that the lesions had been reduced still further and that they no longer had an elevated appearance. Several of the small whitish lesions exhibited a fine sprinkling of normal pigment. During this period daily temperature peaks remained at about 100°; spinal fluid findings were normal. (See Table.) Gastric and urine cultures for tubercle bacilli done in April, June, and October were negative. An x-ray film taken on June 25 showed that the miliary pulmonary lesions were clearing rapidly, and by July 15 the lesions had reached their maximum regression. On July 25, examination revealed no further activity in the fundi; and on September 5 the only change was a slightly greater clumping of pigment over a few of the lesions. Since that time no change has been observed in the fundi.

In May, 1953, about 14 months after the clinical onset of miliary tuberculosis, she was discharged from the sanatorium. Since then she has reported as an outpatient for x-ray film and clinical examinations at three-month intervals. In October, 1953, after a normal period of gestation, she gave birth to a healthy infant. When last seen in August, 1955, she presented convincing evidence that her tuberculosis remained inactive. She had been taking isoniazid, 50 mg. three times daily to the present time. That she should have become pregnant within a year of the onset of meningitis, and should now, 22 months postpartum, be in an excellent state of health seem especially significant in view of the long and widely held belief that childbearing exerts a deleterious effect on tuberculosis⁶ and in view of the fact that it was during pregnancy that generalized, near-fatal tuberculosis developed.

SUMMARY

Since the initial 30-day period of treatment with streptomycin and para-aminosalicylic acid was not adequate to account for the improvement and subsequent recovery of this patient, it may be assumed that isoniazid, which was used alone thereafter, was the effective agent responsible for these developments. Ritchie, Taylor, and Dick⁷ have described the significant histological findings that lesions of miliary and meningeal tuberculosis undergo resolution with isoniazid while similar lesions treated with streptomycin fibrose. When these two drugs are used in combination the isoniazid effect predominates. The mortality rate and the incidence of neurological sequelae (from either meningitis or from treatment with intrathecal streptomycin) is still high with currently accepted antibiotic regimens. Until more is known about isoniazid in the treatment of miliary and meningeal tuberculosis the combination of isoniazid, streptomycin (intramuscular), and possibly para-aminosalicylic acid may be the regimen of choice. The present case has demonstrated marked therapeutic effect from isoniazid alone.

SPINAL FLUID FINDINGS

Date	Cells	Culture for				
		T.B.	Sugar	Chlorides	Proteins	Gold Sol
4/8/52	16	Pos.	48	660	38	0000000000
4/16/52	154	Neg.	43	614	50	0122221000
5/7/52	25	Neg.	41	603	150	123321000
5/20/52	18	Neg.		644	166	1233210000
6/14/52	19	Neg.	36	684	100	
7/23/52	5	Neg.	53	705	50	
9/10/52	0	Neg.	60.3	732	45	
10/20/52	7	Neg.	62.0	727.5	45	
11/20/52	6	Neg.	69	687		
12/22/52	5	Neg.	59	762	35	

RESUMEN

Puesto que el periodo inicial del tratamiento con estreptomicina durante 30 días asociados al PAS no fué adecuado para considerarlo como causa de la mejoría ulteriormente observada en este enfermo debe presumirse que se debió a la isoniácida que después fué usada solamente. Ritchie, Taylor y Dick⁷ han descrito los cambios histológicos significativos que sufren las lesiones de tuberculosis miliar y meníngea que cuando son tratadas con isoniácida, se resuelven y cuando se tratan con estreptomicina hacen fibrosis. Cuando estas dos drogas se usan en combinación,

los efectos de la isoniácida predominan. La mortalidad y la incidencia de las secuelas neurológicas (sea de meningitis o por tratamiento con estreptomycina intratecal) es aún alta los regímenes de antibióticos aceptados. Hasta que se conozca más acerca de la isoniácida en el tratamiento de la tuberculosis miliar y meníngea la combinación de estreptomycina, (intramuscular), isoniácida y quizás PAS, puede ser el régimen de elección. El caso que se presenta ha demostrado marcado efecto terapéutico por la isoniácida sola.

RESUME

Chez un malade, une période initiale de 30 jours de traitement par la streptomycine et le P.A.S. ne fut pas suffisante pour amener une amélioration. Etant donné que la guérison fut obtenue ultérieurement, on peut penser que l'isoniazide seule utilisée par la suite, est responsable de cette évolution. Ritchie, Taylor et Dick ont décrit des constatations histologiques concluantes: des lésions de tuberculose miliaire et méningée avaient finalement disparu sous l'influence de l'isoniazide, tandis que des lésions semblables, traitées par la streptomycine s'étaient "fibrosées." Quand ces deux produits sont utilisés en association, l'effet de l'isoniazide prédomine. Le taux de mortalité et la fréquence des séquelles neurologiques (provenant soit de la méningite, soit du traitement par la streptomycine intrarachidienne) sont encore élevés les posologies antibiotiques couramment admises. Tant que nos connaissances ne seront pas plus approfondies au sujet de l'isoniazide dans le traitement de la tuberculose miliaire et méningée, l'association isoniazide-streptomycine (intramusculaire) et éventuellement P.A.S. semble être le régime de choix. Le cas présenté démontre l'effet thérapeutique remarquable de l'isoniazide utilisée seule.

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Participation of Physicians in Private Practice In Basic Tuberculosis Control Procedures

A. *Prevention*

1. Phases of program in which physicians can participate in a professional capacity.
 - a. It is the responsibility of all physicians not only to inform his own patients and their families about the dangers of tuberculosis, its mode of spread and methods of control, but also to assist in preparing the disseminating informational material to the public in cooperation with the health department, tuberculosis associations, and other agencies interested in control and treatment of tuberculosis.
 - b. Early casefinding and diagnosis:
 - (1) The doctor's office is a productive site for casefinding. The physician should consider the possibility of tuberculosis in every patient and examine as many as possible by roentgenologic study, especially those with any suspicious signs or symptoms or with history of exposure to tuberculosis, x-ray, tuberculin tests and bacteriological examination should be used as freely as possible.
 - (2) Physicians should examine all the contacts of their tuberculous patients to find the source of the disease and to detect its spread to others; or should make sure that they are examined by public health department or other clinics. Tuberculin tests and x-ray films should be used.
 - (3) All physicians should encourage their hospitals to establish a program of routine hospital admission x-rays; if such a program is in effect, to promote its fullest use. As far as admission and periodic chest x-ray films in mental and other institutions are concerned, physicians can influence the responsible operating agencies to institute such programs.
 - (4) Those physicians who sit on policy making committees should direct surveys to high prevalence areas.
 - (5) Private physicians should welcome and support community x-ray surveys; they should participate in them as policy makers; each physician should make certain that suspects screened out by the survey are examined carefully using all the appropriate diagnostic tools; he should sit in on film reading sessions.
 - (6) As consultants or board members for mental and penal institutions or as staff physicians, should promote routine

and periodic chest x-raying in such institutions, as well as routine x-raying in jails.

- (7) Physicians should support and use laboratory services as needed and especially in doubtful tuberculosis cases. Accepted laboratory techniques, particularly culture and guinea pig inoculation examinations should be used since one should not rely on direct smears.
 - c. It is the duty of all physicians to do everything possible to hospitalize every open active case of tuberculosis. If beds are not available, patients should be adequately isolated and treated at home. It is also the physician's responsibility to see that the patient remains under treatment for a period of time sufficient to reduce the possibility of relapse to a minimum.
 - d. BCG vaccination of physicians, medical students, nurses, laboratory workers, contacts and others in the more vulnerable groups, who as non-reactors are exposed to tubercle bacilli, should be left to the discretion of the individual physician in the individual case.
2. Phases of the program in which physicians can actively cooperate with others in community projects.
 - a. Private physicians should refer patients and families to health departments and other health agencies for bedside nursing care, assistance in isolation practices, epidemiologic investigations and family education.
 - b. The private physician should refer tuberculous patients and their families to social services and public assistance agencies when necessary.
 - c. Physicians, as citizens, can actively participate in community projects aimed at slum clearance, low cost housing projects and other movements aimed at general betterment of the community.
 - d. The practicing physician should emphasize the importance of pasteurization of milk and milk products, and should support the tuberculin testing program for eradication of tuberculous cattle.

B. Treatment and Follow-up

1. Private physicians have always played and will continue to play a prominent role in the treatment of tuberculosis. While government sanatoria care for the majority of hospitalized tuberculous, many chest physicians, internists, and other specialists, are on consultant staffs and play a dominant role in setting treatment policies.
2. In the absence of sanatorium or hospital beds, medical care of tuberculous patients at home is largely in the hands of private physicians. Organized home care programs are operating in many

communities in which private physicians should actively participate; they should make certain that patients receive necessary nursing and other services to aid in carrying out medical recommendations.

3. The new drugs have increased the number of tuberculous patients who are eligible for post-sanatorium ambulatory treatment. A large number of these are under the supervision of either private physicians or public clinics.
4. Physicians should perform and stimulate regular follow-up examination of tuberculous patients in the doctor's office or chest clinics. Physicians in private practice often serve part-time in tuberculosis or chest clinics, and all physicians should encourage good clinic service. Private physicians should welcome the help of public health nurses with patients' families and contacts to keep them under medical supervision and increase their understanding of the disease and its spread. In some communities medical social workers are available and can visit patients with social problems. Occasionally voluntary associations employ occupational therapists who can be of assistance to patients in their homes.
5. Ideally, no diagnosed case of tuberculosis should ever be dropped from periodic examination. However, after tuberculosis patients have been inactive for two years close supervision can be relaxed. Physicians should, nevertheless, advise their patients with inactive disease to have an annual examination including a x-ray film.

C. Reporting

1. Physicians should routinely and promptly make out morbidity cards on cases of tuberculosis which come to their attention. If there is any doubt about a previous report being made, the physician should make one out anyhow to assure the completeness of registration and epidemiological follow-up. Death certificates should not only indicate tuberculosis as an immediate or ultimate cause of death, but also as an accompanying condition when present.
2. Private physicians should provide health departments with information about the current status of tuberculosis patients under their care so that continued knowledge and supervision of all cases of tuberculosis in the community is assured.

D. Provision to the patient of indicated ancillary services

1. It is the responsibility of the private physician to assess the patient's capacity for work in terms of residual disease in the lungs and/or other organs and determine the amount and types of activity permissible for the individual. He must make decisions as to whether or not the patient can return to his former occupation or whether he should return to one requiring less physical exertion. In this

decision as in those relating to diagnosis and treatment he can to advantage avail himself of specialist consultation.

2. When it is evident that the patient is in need of vocational training to equip him to enter a new occupation, the physician should be aware of the facilities available for such training. He can call upon the services of the vocational counselor of the Division of Vocational Rehabilitation in his State or territory to assist him.

Council on Public Health

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College News

INTERIM SESSION OF THE COLLEGE

The Interim Session of the American College of Chest Physicians will be held at the Sheraton Plaza Hotel, Boston, Massachusetts, November 27 and 28, 1955. The Clinical Meeting of the American Medical Association will be held in Boston, November 29 through December 2.

On Saturday, November 26, the Board of Examiners of the College will conduct oral and written examinations for Fellowship, and on Sunday, November 27, the Board of Regents and Board of Governors of the College will hold their semi-annual meetings at the Sheraton Plaza Hotel.

A scientific program, sponsored by the New England States Chapter of the College, will be presented at the Sheraton Plaza Hotel on Monday, November 28. Dr. Richard H. Overholt, Boston, Chairman of the program committee, has announced that the following program has been completed:

Morning Session

"Thoracic Pain Due to Esophageal Disease"

Herman J. Moersch, Rochester, Minnesota

"Skin Reactions to a Nicotinic Acid Ester in Tuberculosis (Studies with Tetrahydrofurfuryl Ester of Nicotinic Acid)"

Milton S. Saslaw and Murray M. Streitfeld, Miami, Florida

"Tests for Distinguishing Types of Diffuse Airway Obstruction"

Harry B. Martin, E. J. M. Campbell, R. H. Shepard and Richard L. Riley, Baltimore, Maryland

Panel Discussion: "The Short-of-Breath Patient"

Burgess L. Gordon, Philadelphia, Pennsylvania, Moderator

Panel: Albert H. Andrews, Chicago, Illinois

Alvan L. Barach, New York City

Otto C. Brantigan, Baltimore, Maryland

Simon Dack, New York City

Round Table Luncheon Discussions

"Cor Pulmonale"

Alvis E. Greer, Houston, Texas; Hollis E. Johnson, Nashville, Tennessee; William Likoff, Philadelphia, Pennsylvania; Elliot V. Newman, Nashville, Tennessee

Moderator: John F. Briggs, St. Paul, Minnesota

"Antimicrobial Agents"

Edward Dunner, Washington, D. C.; Russell H. Frost, Oak Terrace, Minnesota; Donald R. McKay, Buffalo, New York

Moderator: Harold G. Trimble, Oakland, California

Afternoon Session

"Surgical Operation for Coronary Artery Disease"

Claude S. Beck, Cleveland, Ohio

Panel Discussion: "Hemoptysis"

Edwin R. Levine, Chicago, Illinois, Moderator

Panel: Alfred Goldman, St. Louis, Missouri

Chevalier L. Jackson, Philadelphia, Pennsylvania

William A. Hudson, Detroit, Michigan

David H. Waterman, Knoxville, Tennessee

Diagnostic-Treatment Conference

M. C. Sosman, Boston, Massachusetts, Moderator

Panel: Oscar Auerbach, East Orange, New Jersey

Edgar W. Davis, Washington, D. C.

Donald S. King, Hanover, New Hampshire

Coleman B. Rabin, New York City

Evening Session

Cocktail Party and Dinner

Guest of Honor: James H. Stygall, Indianapolis, Indiana, President,
American College of Chest Physicians

Fireside Conferences

Subjects and Discussion Leaders

"Emphysema"

Andrew L. Banyai, Milwaukee, Wisconsin and Peter A. Theodos, Philadelphia, Pennsylvania

"Tumors of the Lung"

J. Maxwell Chamberlain and Edgar Mayer, New York City

"Coronary Disease"

David Gelfand, Philadelphia, Pennsylvania and Alfred Goldman, Los Angeles, California

"Immunity and Vaccination in Tuberculosis"

Robert J. Anderson, Washington, D. C. and J. Arthur Myers, Minneapolis, Minnesota

"Angiocardiology"

David M. Gould, Baltimore, Maryland and Israel Steinberg, New York City

"Advances in Cardiac Surgery"

Robert P. Glover, Philadelphia, Pennsylvania and Charles A. Hufnagel, Washington, D. C.

All physicians are cordially invited to attend the Scientific Sessions; there is no registration fee. For reservations, please write to the Sheraton Plaza Hotel, Boston, and give arrival and departure dates. Be sure to mention that you will attend the meeting of the American College of Chest Physicians.

PLANS PROGRESSING FOR FOURTH INTERNATIONAL CONGRESS

Arrangements for the Fourth International Congress on Diseases of the Chest, sponsored by the Council on International Affairs of the College, Cologne, Germany, August 19-23, 1956, are progressing. Many requests for information and places on the scientific program have been received, and as soon as more complete details have been worked out by the arrangements and program committees, further announcements will be made. In the meanwhile, it is suggested that members and other physicians interested in attending the Fourth International Congress at Cologne, inform the Executive Offices of the College in Chicago regarding their plans. Physicians who have carried out original work in diseases of the chest (heart and lung) which they wish to present, are invited to send outlines of their studies to Dr. Andrew L. Banyai, Chairman, Committee on Scientific Program, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois, U.S.A. Motion pictures and exhibits dealing with heart and lung disease are also of interest and complete data should be forwarded to Dr. Banyai. The committee will give proper consideration to all requests for places on the scientific program.

As announced previously, Chancellor Konrad Adenauer is Honorary President of the Congress, and Professor Gerhard Domagk, Nobel Prize Winner and discoverer of the sulfonamides, is the President. Professor H. W. Knipping of Cologne is Vice President, Professor Josef Jacobi of Hamburg the Secretary General, and Professor Joachim Hein, Toensheide/Schleswig Holstein, Regent of the College for Germany, is Chairman of the Executive Committee for the Congress. Dr. Ernst Schwering, Mayor of the City of Cologne, extends a cordial invitation to all members of the College to attend this important world congress. It is anticipated that countries throughout the world will send delegations.

Official travel agent for the Congress is the International Travel Service, Inc. of Chicago, which is presently engaged in organizing several pre- and post-convention tours. Information concerning these tours will be announced to the membership at an early date.

1956 ANNUAL MEETING PROGRAM

Dr. William A. Hudson, Detroit, Michigan, Chairman of the Committee on Scientific Program for the 22nd Annual Meeting of the College to be held at the Sherman Hotel, Chicago, June 7-10, will welcome recommendations from members of the College in connection with the scientific program. He is particularly interested in learning about new studies in cardiovascular and pulmonary disease. Please forward information about such studies directly to Dr. Hudson, 602 David Whitney Building, Detroit 26, Michigan.

Physicians interested in presenting their work at the 22nd Annual Meeting of the College are invited to write to Dr. Hudson; abstracts of scientific papers should accompany all requests for places on the program.

Other members of the Committee on Scientific Program are: Dr. Albert H. Andrews, Chicago, Illinois, Vice-Chairman; Dr. Burgess L. Gordon, Philadelphia, Pennsylvania; Dr. Paul H. Holinger, Chicago, Illinois; Dr. Fay A. LeFevre, Cleveland, Ohio; Dr. Coleman B. Rabin, New York, N. Y.; and Dr. David Salkin, San Fernando, California.

College Chapter News

JOINT MEETING NORTHEAST AND EAST BRAZIL CHAPTERS



A joint meeting of the Northeast and East Brazil Chapters of the College was held in Salvador, June 25-26. Presiding at the scientific sessions were: Dr. Joaquim S. Cavalcanti, Governor of the College for Pernambuco, Dr. Melo Motta, representative for the state of Alagoas, and Dr. Gilmaro Teixeira, representative from Ceara. Dr. Jose Silveira, Governor of the College for Bahia, presented the welcoming address.

COLORADO CHAPTER

The Colorado Chapter (formerly the Rocky Mountain Chapter) held its annual meeting in Denver on September 24. The following officers were elected:

President:	William F. Stone, Colorado Springs
Vice-President:	Robert K. Brown, Denver
Secretary-Treasurer:	Leroy Elrick, Denver

**ORGANIZATIONAL MEETING
RIO GRANDE DO SUL (BRAZIL) CHAPTER**



At an impressive ceremony held in the Palace of the Governor of the State of Rio Grande do Sul in Porto Alegre, Brazil, the Rio Grande do Sul Chapter of the College was organized on June 25, 1955. Prof. Carlos Bento, Governor of the College for the state and President of the Tuberculosis Society of Rio Grande do Sul, conducted the ceremony. The inaugural session was attended by Dr. Ildo Meneghetti, the Governor of Rio Grande do Sul, as well as high government, military, and ecclesiastical officials, and members of the College and their guests.

Prof. Bento, in his opening address, spoke of the objectives of the College and emphasized the international aspects of the organization, pointing out that the College, like science, is not bounded by territorial lines. Prof. Bento, under whose leadership the chapter was formed, then introduced Dr. Carlos Orlando da Cunha, Secretary of State, who presented a Fellowship key, on behalf of the College, to Dr. Meneghetti. Governor Meneghetti accepted the key "as a token of inter-American friendship" and welcomed the formation of the chapter of the College in Rio Grande do Sul.

A convocation followed during which Governor Meneghetti conferred Fellowship diplomas upon members of the new chapter and congratulated them upon their election to the College.

POTOMAC CHAPTER

The annual meeting of the Potomac Chapter was held on October 7 in White Sulphur Springs, Virginia. The following chapter officials were elected:

President:	Edmund G. Beacham, Baltimore, Maryland
Vice-President:	Roy G. Klepser, Washington, D. C.
Secretary-Treasurer:	J. Winthrop Peabody, Jr., Washington, D. C. (re-elected)

KENTUCKY CHAPTER

The annual meeting of the Kentucky Chapter was held at the Brown Hotel, Louisville, on September 29. The newly elected chapter officials are as follows:

President:	Alvin B. Mullen, Waverly Hills
Vice-President:	Otis B. Shelton, Outwood
Secretary-Treasurer:	J. Ray Bryant, Louisville

College News Notes

Dr. Bret Ratner, New York, New York, was recently awarded a scroll which reads: "By unanimous vote of the Section on Allergy of the American Academy of Pediatrics assembled in Chicago at the Twenty-third annual meeting of the Academy, this scroll is awarded as an expression of gratitude and appreciation for untiring services in advancing pediatric allergy as a pioneer investigator and teacher, as organizer of the Section on Allergy and as its first chairman, and for successful efforts in obtaining recognition by certification for pediatric allergists in the sub-specialty of pediatric allergy." The award was made by Dr. Jerome Glaser, Rochester, New York.

Dr. Howard F. Root, Boston, Massachusetts, Governor of the College for his state, recently visited with Dr. Abdel-Aziz Sami, Cairo, Governor of the College for Egypt. As Dr. Sami's guest, Dr. Root visited the Permanent Council on Health, Education and Social Service and discussed with the officers their plans to provide for additional hospital beds in Egypt, as well as the establishment of small units for health, education, and nursing service in small villages in the rural area of Egypt. Dr. Root also visited Athens, where he was welcomed by Dr. Basil Papanicolaou, Governor of the College for Greece. In Geneva, Switzerland, Dr. Root visited the Governor of the College, Dr. Maurice Gilbert. Dr. Root addressed the Medical Society of the Hashemite Kingdom of Jordan and the Medical Faculty of the American University of Beirut. As Vice-President of the International Diabetes Federation, Dr. Root presented a paper at their Congress held in Cambridge, England.

Dr. Jose Silveira, founder and Director of the Brazilian Institute for Tuberculosis Research, Salvador, Bahia, Brazil, announces that a new addition to the Institute has been completed which will house the Departments of Bacteriology, Pathology, and Biochemistry. Dr. Silveira is Governor of the College for Bahia.

Dr. Juan Max Boettner, Asuncion, Paraguay directed the Sixth Postgraduate Course on Tuberculosis and Thoracic Pathology held at the Sanatorio Bella Vista, October 17-29. The course was presented under the sponsorship of the Ministry of Public Health and Social Welfare and the Inter-American Cooperative Service for Public Health.

COLLEGE ESSAY CONTEST

The 1956 Prize Essay Contest of the College is open to undergraduate medical students throughout the world. The Board of Regents has recommended that members of the College affiliated with medical schools be urged to bring the contest to the attention of the student body at their respective schools. Essays may be submitted on any phase of cardiac or pulmonary diseases. Three prizes will be awarded comprising certificates and cash awards in the amounts of \$250, \$100, and \$50. The contest will close on April 10, 1956 and instructions for the preparation of manuscripts are as follows:

- 1) Five copies of the manuscript typewritten in English (double spaced) should be submitted to the Committee on College Essay, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois, U.S.A.
- 2) The only means of identification of the author shall be a motto or other device on the title page and a sealed envelope bearing the same motto on the outside, enclosing the name and address of the author.
- 3) A letter from the Dean or Chairman of the Department of Medicine or Surgery of the medical school, certifying that the author is a medical student.

CARDIOVASCULAR RESEARCH AWARD

The Committee on Cardiovascular Diseases of the Council on Research, American College of Chest Physicians offers an award of \$500 for the best manuscript on "Acute Pulmonary Edema." The study may be of either an experimental or a clinical type and may include problems of therapy. The original work, based on personal research, should be presented before May 1, 1956. It may consist of an unpublished manuscript or a recently published article (after April 1, 1955). If the manuscript is unpublished, publication may take place either in *Diseases of the Chest*, or in another journal, according to the wish of the author.

For further information, please write to Dr. Aldo A. Luisada, Chairman, Section on Cardiovascular Physiology, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

BACK ISSUES OF DISEASES OF THE CHEST REQUESTED

A large tuberculosis sanatorium in India would like to receive back issues of *Diseases of the Chest*. For details, please write to Dr. Douglas N. Forman, Secretary, Christian Medical Council for Overseas Work, Room 1111, 156 Fifth Avenue, New York 10, New York.

LECTURE SERIES

The Tennessee Department of Mental Health, Tennessee Psychiatric Association, and the American College of Chest Physicians announce a series of lectures on Psychiatry, Psychosomatics, and Tuberculosis to be held at Veterans Administration Hospital No. 88, Memphis. Further information may be obtained from Dr. B. A. Cockrell, Manager, Veterans Administration Hospital 88, Memphis 4, Tennessee.

BOOK REVIEWS

"LEHRBUCH DER TUBERKULOSE DES KINDES UND DES JUGENDLICHEN"

by W. Catel, Second Edition, Georg Thieme Verlag, Stuttgart, 1954.

This is a text of sound conception and thorough didactic planning. Exposition of worthwhile clinical material is based on a comprehensive presentation of pertinent anatomical and physiological data. It contains a fine chapter on the bacteriology of the causative micro-organism. Another chapter deals competently with the immunology of tuberculosis. Parenchymal and hilar changes encountered in the primary phase of the disease are exceedingly well portrayed from the pathological as well as from the clinical standpoint. Similarly comprehensive discussion is presented on reinfection tuberculosis and generalized tuberculosis. Concise and interesting chapters discuss extrapulmonary forms of tuberculosis, including mucous and serous membranes, bones and joints, central nervous system and genito-urinary tract. The author has done laudable work in preparing the chapter on differential diagnosis. Passages dealing with the medical and surgical management of tuberculosis are well covered although in some parts do not reflect historical accuracy and current perspectives. It is a handsomely made book technical features of which deserve special compliments.

Andrew L. Banyai, M.D.

"CLINICAL PATHOLOGICAL CONFERENCES OF COOK COUNTY HOSPITAL"

by Hans Popper and D. S. Kirchner. McGraw-Hill Book Company, Inc., 1954. Volume I, Price \$5.00.

This volume is made up of case records of interesting and unusual patients taken from the files of the weekly pathological conferences held at the Cook County Hospital from 1946 to 1953. The discussions of able clinicians and the enlightening discourse on the postmortem findings and the pathogenesis of the clinical picture are set down with occasional editorial notes and literature references. The sources of material for the presentations of the pathologist and the correlation with clinical data are given.

The book's contents have been divided into three parts. Part I, Cardiac problems, is made up of 11 cases in the discussion of which most of the common and some rare conditions are recovered. Part II, Vascular problems, is made up of 7 cases. Part III, renal problems, is made up of 8 instructive cases. The volume supplies clinical material, history, physical examination and laboratory data on 26 provocative cases to test the physician's medical acumen. Unfortunately, medical jargon has crept into the reports and almost all cadavers are well developed and well nourished. The cases, if studied, will broaden the physician's diagnostic ability.

George R. Herrmann, M.D.

"ARCHIV UND ATLAS DER NORMALEN UND PATHOLOGISCHEN ANATOMIE IN TYPISCHEN RONTGENBILDERN. DIE BRONCHOGRAPHIE"

by Ernst Stutz and Heinz Vieten, Georg Thieme Verlag, Stuttgart, 1955.

This excellent book contains a wealth of information in regard to bronchopulmonary anatomy and pathology. It discusses the various types of contrast media used in bronchography and the details of technics of using them. The chapters on anatomy describe the normal bronchial pattern of the entire tracheobronchial tree and give detailed descriptions and illustrations of the lobar and segmental patterns. Normal anatomical variations and congenital anomalies are then shown followed by descriptions of physiological observations obtained from bronchographic studies. The second half of the book deals with tracheal and bronchial pathology as demonstrated by bronchography. The text and the illustrations are excellent and are supported by an extensive bibliography. The book is clearly written and well printed. It should be of interest to the chest physician and surgeon, the radiologist and the bronchologist.

Paul H. Holinger, M.D.

CALENDAR OF EVENTS

NATIONAL AND INTERNATIONAL MEETINGS

Interim Session, American College of Chest Physicians
Sheraton Plaza Hotel, Boston, November 27-28, 1955

22nd Annual Meeting, American College of Chest Physicians
Hotel Sherman, Chicago, Illinois, June 7-10, 1956

Fourth International Congress on Diseases of the Chest
Council on International Affairs
American College of Chest Physicians
Cologne, Germany, August 19-23, 1956

POSTGRADUATE COURSES

8th Annual Postgraduate Course on Diseases of the Chest
Park-Sheraton Hotel, New York City, November 14-18, 1955

Postgraduate Course on Diseases of the Chest
Ambassador Hotel, Los Angeles, California, December 5-10, 1955

CHAPTER MEETINGS

Southern Chapter, Houston, Texas, November 13-14, 1955

Oklahoma Chapter, Oklahoma City, December 4, 1955

Clinical Meeting, New York State Chapter
New York City, February 17-18, 1956

Obituary

FRED GOODING HOLMES

1889-1955

Dr. Fred Gooding Holmes, Phoenix, Arizona, has departed this earth suddenly and tragically. Perhaps the manner in which he went brings more sharply into focus the qualities from which we received our impressions of him.

On Saturday, August 6, at five a.m., he embarked with his son, Fred W., and his two grandsons, Fred and Stephen, on the Klamath Bay near the mouth of the Klamath River, in a sixteen foot boat. The boat was equipped with an outboard motor. It had life preservers for each, and salmon fishing equipment. Fred Sr. had been fishing in the bay for some weeks prior to this fateful morning and had been there a number of times in years past. They expected to return about nine a.m. The fog rolled in before sun-up and nine o'clock passed with no sign of the party. Dense fog continued during the day. Search parties failed to locate any sign of the boat or the Holmes family. On the next day, the body of Fred Jr. was found washed up on the shore, about four miles north of the mouth of the Klamath River. Continued search up to the present writing has failed to locate the rest of the members of the group. The boat was found awash near the body, and two life preservers were still attached. Whether outboard motor failure or confused directions as a result of the fog swept them into the rough water of the river where the tide meets the river flow and capsized the boat, is speculation.

Dr. Holmes' practice, from the time of specialization in chest diseases in 1920, was entirely private practice. He was a great enthusiast for pneumothorax which was then on the ascendancy. In 1935, he spent nine months resting after having developed a pulmonary tuberculous lesion and during this period he wrote *TUBERCULOSIS—A BOOK FOR THE PATIENT*.

Dr. Holmes was a graduate of Harvard Medical School and did postgraduate work at the University of Vienna. He was the 39th physician to become a member of the American College of Chest Physicians. In 1947, Dr. Holmes retired from the practice of medicine in order to work on community projects which were so important to him and became a Fellow Emeritus of the College at that time.

Howell Randolph, M.D.
Governor

JACOB J. MENDELSON

1891-1955

Dr. Jacob J. Mendelson passed away suddenly at his home in Chicago on July 26. He received his degree of Doctor of Medicine at Loyola University in 1912 and served his internship at the Illinois State Hospitals.

He had practiced in Chicago as a specialist in diseases of the chest since his graduation from medical school. Dr. Mendelson was Clinical Professor of Medicine at the Stritch School of Medicine of Loyola University, Medical Director of the Fox River Tuberculosis Sanatorium, and Attending Physician at Columbus, Franklin Boulevard, and Weiss Memorial Hospitals.

Dr. Mendelson was a member of the Chicago Medical Society, the Illinois State Medical Association, the American Medical Association, and the Chicago Tuberculosis Society. He was a Fellow of the American College of Chest Physicians for many years, as well as the Illinois Chapter in which he took part in many of its activities. The day prior to his demise, he had written a letter to the Postgraduate Course Committee of the College in Illinois expressing his pleasure in having been invited to lecture at the 10th Annual Postgraduate Course to be presented in Chicago. His friends and colleagues in this city missed his presence at the postgraduate course in which he had always been an interested participant.

Dr. Mendelson is survived by his wife Grace, three daughters, and five grandchildren.

Otto L. Bettag, M.D.
Regent

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Staff and resident physicians wanted in tuberculosis hospital. Service includes a great deal of internal medicine and chest surgery. Approved pulmonary disease residency. Excellent salary, plus maintenance if desired. Eligibility for state license required. Please write to: Superintendent, Sunnyside Sanatorium, Indianapolis 26, Indiana.

Staff physicians wanted for Neuropsychiatric-Tuberculosis service at newly activated Veterans Administration Hospital, Sepulveda, California, located 25 miles from downtown Los Angeles. Tuberculosis experience required. Affiliated with 3 medical schools. Apply: Manager, Veterans Administration Hospital, Sepulveda, California.

Physicians specializing in tuberculosis and chest diseases wanted for 600-bed hospital, located 30 miles from Springfield, Missouri. Developing pediatrics department, in-service and affiliation program. Merit system benefits. Full maintenance and laundry minimum rate. Following positions are open: Physician I (tuberculosis): \$6,000-\$8,000; Physician II (tuberculosis): \$7,000-\$10,000; Physician III (tuberculosis): \$8,000-\$12,000. Write: Medical Director, Missouri State Sanatorium, Mt. Vernon, Missouri.

Clinical director wanted for modern tuberculosis annex to general hospital (127 tuberculosis patients at present); must be citizen of the United States and eligible for Louisiana licensure; salary dependent upon qualifications and experience. Building program will increase capacity to over 200 beds. All modern facilities available. Write: O. P. Daly, M.D., Superintendent, Lafayette Charity Hospital, Lafayette, Louisiana.



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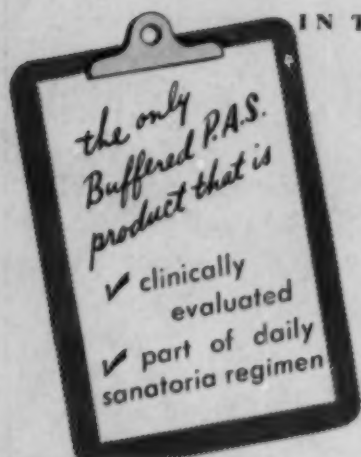
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